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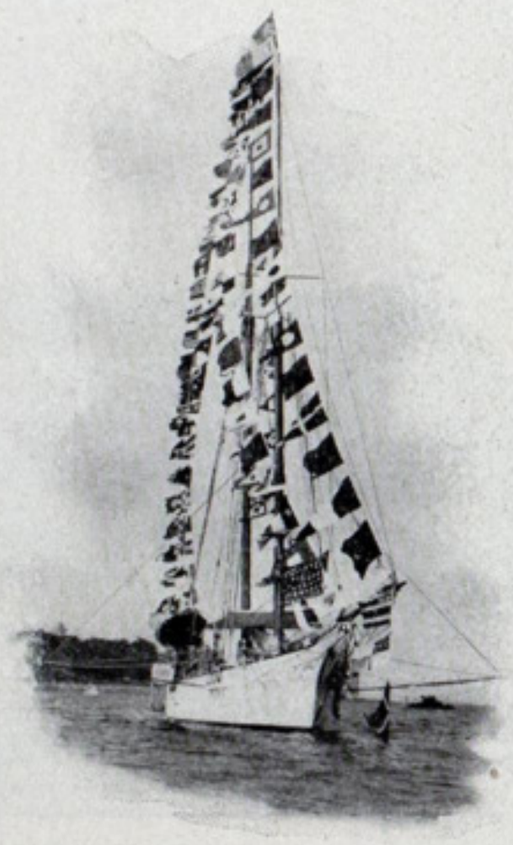
H. H. Rogers' Steam Yacht Kanawha.



CARLOTTA.

The steam yacht Kanawha, the queen of the fleet, was built for the late John P. Duncan of New York from designs by Mr. Charles L. Seabury of the Gas Engine & Power Co., and Charles L. Seabury & Co., Consolidated, and launched in June, 1899, from the yards of that concern at Morris Heights, New York city. The yacht immediately attained fame by defeating the steamer Monmouth on the run from Sandy Hook to New York and from that time to the present the Kanawha has held the record as the fastest cruising steam yacht in America, defeating all of the fast craft of her class in eastern waters. At the death of Mr. Duncan the yacht was purchased by Mr. Henry H. Rogers of New York and has since been held always in readiness for a trial of speed with any vessel desiring to try conclusions with her, in addition to conveying her owner from New York to his summer place at New Bedford two or three times a week. Last summer the Kanawha was entered against the new steam yacht Noma, owned by Mr. William B. Leeds, in the 60-mile race off Newport for the Lysistratra cup offered by Mr. James Gordon Bennett, and defeated the Noma by 4 minutes, 56 seconds, the Kanawha's average speed over the course being 19.65 knots per hour, it not being necessary to drive the yacht to her highest speed to win the race.

This year the steam yacht Hauoli, owned by Mr. F. M. Smith, is entered against the Kanawha for the second race for this cup and the Kanawha has been at the works of her builders receiving a thorough overhauling at their hands, including the retubing of her boilers, so that she will be in perfect condition for the contest.

The contract for the building of the Kanawha was signed July 18, 1898, and the vessel was constructed in accordance with the rules of the United States Standard Steamship Owners, Builders & Underwriters Association. The principal dimensions of the vessel are as follows: Length over all, 227.3 ft.; length water line, 192 ft.; beam, 24.4 ft.; depth, 15 ft.; draught, 11.6 ft.

The keel and center keelsons are formed in a continuous vertical plate 26 in. deep by 14 lbs., tapered in depth from the center forward and aft. The keelson extends above the floors and is connected to the floor stringer and reverse frames by two keelson angle bars. The keelson has a 3-in. smooth limber hole cut in every frame space level with those of the floor. The floor stringers are well riveted to the reverse frames and keelson and the butts are connected by single straps on the under side, double riveted. The stern post is of best forged steel, the keel end being 6 ft. long scarfed and riveted to the keel.

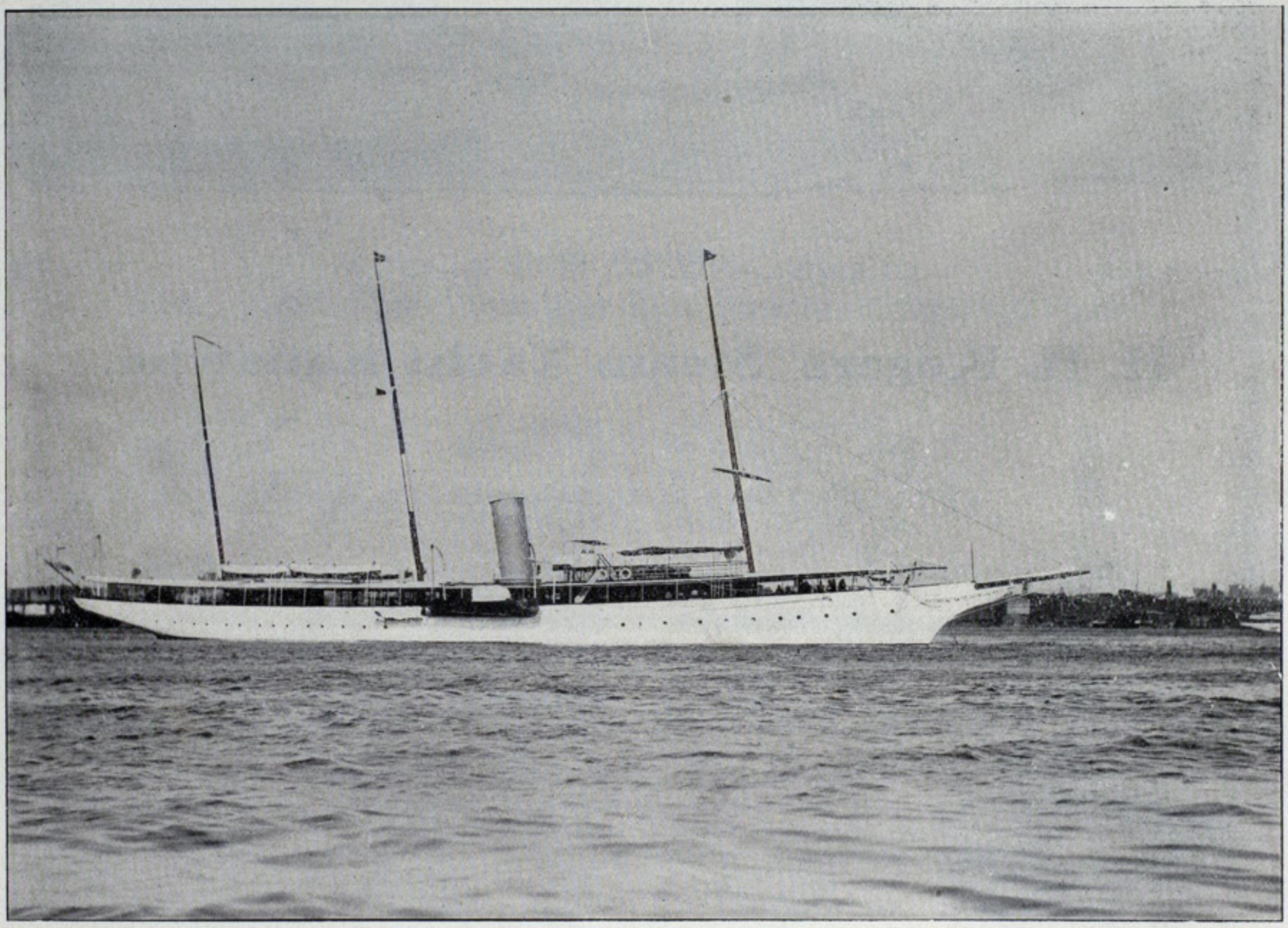
The frames are of 3½ in. by 3 in. by 7 lbs. steel angles through the main body of the yacht and 3 in. by 2½ in. through the forward and aft section, spaced 23 in. All of the bulkhead frames are double. The reverse frames are of 3 in. by 2 in. by 5 lbs. steel angles through the main body of the vessel and 2½ in. by 3 in. through the forward and aft sections and extend up to the gunwale and as high up on the bilge as required by the association. The floors are of mild steel 12½ lbs. amidships and 10 lbs. forward and aft. Toward each end of the vessel the floors increase in depth to firmly connect the sides of the vessel. On each side of the center keelson are two sets of keelsons extending well forward and aft, one at the lower turn of the bilge and one at the upper turn constructed of two angles 4 in. by 3½ in. by 8½ lbs. placed back to back, thoroughly riveted to each other and through the frames. The deck beams are bulbed through the main body of the vessel and made lighter forward and aft, on every frame. The ends of the beams are secured to the frames by gusset plates.

The main stringers on each side are 40 in. wide amidships and 21 in. at each end and 7-16 in. thick, the stringer angles being 3½ in. by 3 in. by 6¼ lbs. The stringers are connected to the sheer strake by angle bars and riveted to the deck beams and sheer strake, extending all around the vessel. Stringer plates of steel are riveted to the deck beams each side of the hatches and skylights to cover two beams forward and aft of each opening. Steel plates are riveted at deck

beams at the fore, main and mizzen masts, the mast holes being cut through these plates. A heavy plate is riveted on the deck beams forward for mounting the steam windlass.

The plating is run in fair lines and in and out strakes below waterline with horizontal seams lapped. Plating above the waterline is run flush with inside straps. The garboard strakes fayed next to frame are reduced in thickness forward and aft, 16 lbs. amidships reduced 2-16 forward and aft. The sheer strakes are 18½ lbs. amidships reduced 2-16 forward and aft. The bottom is 15 lbs. amidships reduced 2-16 forward and aft. The sides are 12½ lbs. amidships reduced 2-16 forward and aft. No plates are less than five spaces of frames in length, except well forward and aft. No butts of the outside plating in adjoining strakes are nearer than two spaces of frame and the butts of alternate strakes are shifted not less than one frame space. All butts of the plating are planed and fitted close and carefully caulked. Butt straps are of mild steel. Space between plating and frames has solid filling or lining spaces in one length, closely fitted. The rivets are of the best quality of steel, the keel, stem and sternpost, lower edge of garboard strakes, all butts of outside plating, stringers and keelsons being double riveted. The bulkheads are five in number and located on double frames and are made of plate steel 8 lbs. per ft. and made water tight. The coal bunkers extend along each side of fire room and across ship and are of plate steel 6 lbs. per foot, properly connected to deck and floor, stiffened and braced with angle steel and fitted with doors. The sides next the hull are celled with yellow pine flooring, part way up the side, laid so as to break joints so that no coal can get into the run. Capacity 190 tons. The rudder is of plate steel, with rudder stock 5 in. diameter and 2¼ in. at the heel with quadrant of steel worked under deck. A hand gear is fitted aft for handling yacht in case of accident to the steam steerer.

The inside of the bottom in bilge is covered with best quality Portland cement and the hull outside is cemented with best iron cement. The hull both inside and out is thoroughly coated with two coats of red iron paint and in addition below the waterline is coated with anti-fouling composition and above waterline with two coats of white paint. All of the inside woodwork is given one coat of boiled linseed oil, then filled and given three coats of best varnish, two coats rubbed.

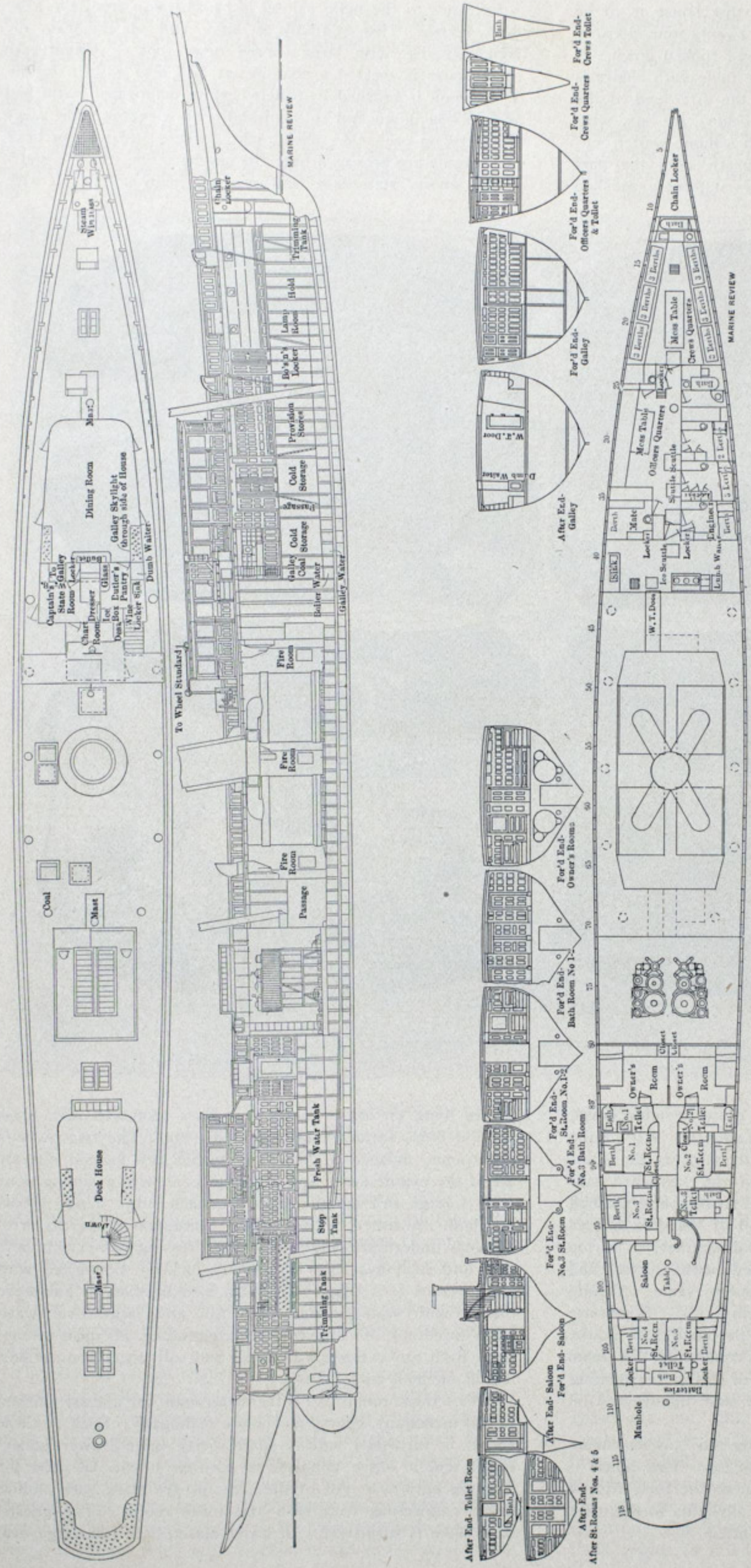


H. H. ROGERS' STEAM YACHT KANAWHA.

The whole of the material for the floors, frames, reverse frames, stringers and plates is of mild steel, the rivets of the best quality of rivet steel. The plates have a tensile strength of 55,000 to 60,000 lbs. per square inch and a reduction of area of not less than 25 per cent. The angle steel has a tensile strength of 60,000 to 65,000 lbs. tensile strength and a reduction of area of not less than 20 per cent.

The decks are of clear white pine in lengths from 25 to 35 ft. fastened with 7-16-in. lag screws to each beam and caulked with two threads of best oakum and one of cotton, seams run with marine blue. Center piece of teak. Planksheer and main rail of teak. Cavils also of teak mounted with bronze. The bulwarks, 3 ft. high, are of steel with steel stanchions paneled inside with teak. All of the deck coamings are of solid teak fastened to a flanged piece of steel.

On the forward deck is a steam windlass to handle the anchors and in the forehold is a chain locker large enough to stow the full amount of chain carried. Forward amidships and aft are bitts of teak trimmed with brass, together with bronze chocks and cleats. Leads are arranged from the



INBOARD PROFILE AND DECK PLANS OF H. H. ROGERS' STEAM YACHT KANAWHA.

falls of the large naphtha launch carried, so that the launch can be hoisted by the steam windlass. There are six pairs of davits arranged so that all of the boats swing over the awnings, two anchor davits forward and gangway cranes on both starboard and port sides aft. Large port lights are fitted on each side of the hull in suitable positions.

Bronze deck plates flush with the deck are located so as to fill the coal bunkers conveniently. An ice storage room with a capacity of 8 tons is located under the floor forward. Steel water tanks are located forward and aft having a capacity of 14,000 gallons. The yacht has three masts with sails of leg of mutton type, the foremost being fitted with a yard. Standing rigging is of the best galvanized steel wire rope. All blocks are lignum vitae with patent roller bearings.

Sails of heavy cotton duck are carried and two awnings, the upper white and the lower blue, extend the full length of the vessel as well as over the top of the forward deck house and the bridge. Large teak gangways with bronze fitting are carried aft on both starboard and port sides and a companion ladder is arranged forward for the crew. Boat booms are carried on both sides also. Two bow anchors of 1,500 lbs. each, one stream anchor of 675 lbs. and two kedge anchors of 325 lbs. weight each, are carried, together with 200 fathoms of 1¼-in. stud link chain.

The yacht is handled with a steam steerer mounted on the bridge and is fitted with a Sir William Thompson compass with compensating binnacle on the bridge and also a hand steerer and compass aft.

Mechanical engine room telegraphs are fitted on the bridge together with hand bell pulls and speaking tube, and a complete telephone system is installed throughout the yacht.

The forward deckhouse is of steel ⅛ in. thick cased in teak, and carlines being of angle steel. The lower part of the house is paneled in teak, the upper part being fitted with plate glass windows. Wooden shutters are provided to fit over the

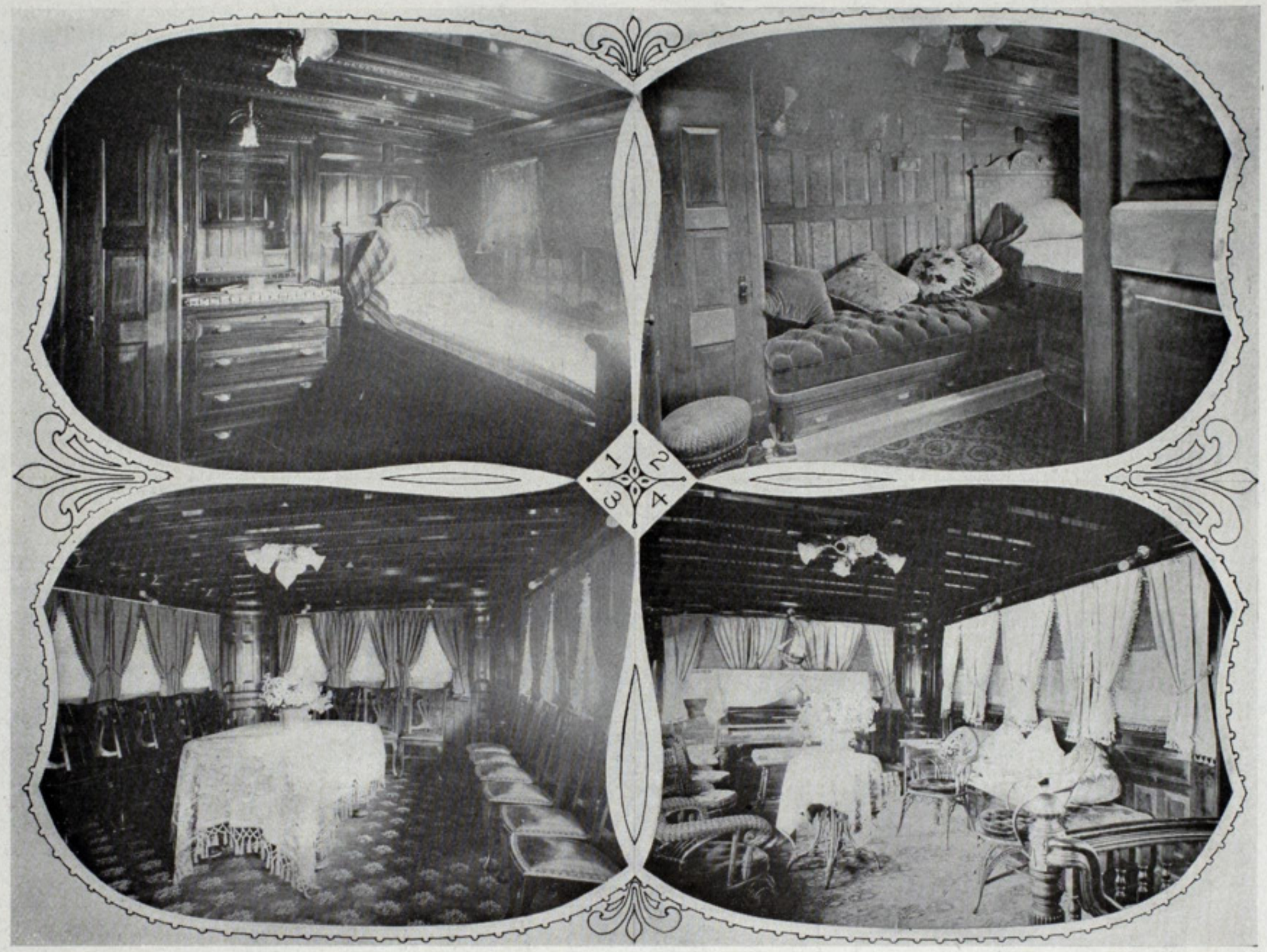
glass for sea service. The interior of this house is to be used as a large dining saloon, seating twenty-four persons, and is finished in mahogany, varnished and rubbed down. A large buffet is in the after end. A large table with chairs is furnished and on the starboard side in the after end of the house is the pantry fitted with shelves, lockers, ice box, wine locker, sink, etc. This room is fitted with a dumb waiter connecting with the galley directly underneath. On the port side aft of the dining room is the captain's stateroom, finished in mahogany, fitted with berth with drawers underneath, folding washbasin, dressing case, desk and safe. Aft of the forward deck house and connected with same is the chart room with entrance from the deck on the starboard side and direct from the captain's room. This room is also finished in mahogany. Around the outside of all of the deck houses is fitted a 2-in. hand rail for use in bad weather. The top of the forward deck house is covered with canvas and painted and a white ash grating is fitted to same. Around the top of this house is a three-bar brass rail. Stairs are arranged on the starboard side back of the main deck house. Aft of the chart room is fitted a room containing the steam steering engine and the laundry, and aft of this is the smoking room furnished with chairs and table and upholstered in leather.

The after deck house is of substantially the same construction but has no brass railing around the top. This house is richly upholstered and has a large divan at the forward end and has seats around the sides over the skylights to the main saloon. At the after end a book case is fitted.

Entrance to the main saloon is by stairway from the after deck house. This stairway is large and of elaborate design, winding, with large carved newel posts. Underneath these stairs is located a coat locker and also a linen locker. The saloon is finished in paneled white mahogany, varnished and rubbed down and is furnished with a center table, large transoms on each side, book racks, lockers and writing desk.

Skylights are arranged over the engine room, owner's staterooms, guests' staterooms and over the main saloon, all with sashes hung on brass hinges and glass protected with brass rods in brass frames arranged to lift out. The two owner's staterooms, finished in bird's-eye maple, are located directly aft of the engine space and are connected with a sliding door with a large full length mirror on each side. These rooms are both furnished with wooden three-quarter berths with drawers underneath and with large dressing cases with mirrors and each has large closet and locker. Connected with these rooms is a large bath room also finished in bird's-eye maple, with water closet, bath tub and large oval wash basin fitted for hot and cold running water, all open plumbing. Bath tub is fitted with fresh and salt water connections. Tiling on floor and sides.

Aft of these rooms are three staterooms for guests, finished in red mahogany, cherry and white mahogany. Each of these rooms is furnished with a single berth with drawer underneath and a settee upholstered so that it can be used for sleeping purposes. All of these rooms are fitted with sliding doors connecting with bath and toilet rooms. The guests' bath room is furnished with water closet, bath tub, large oval



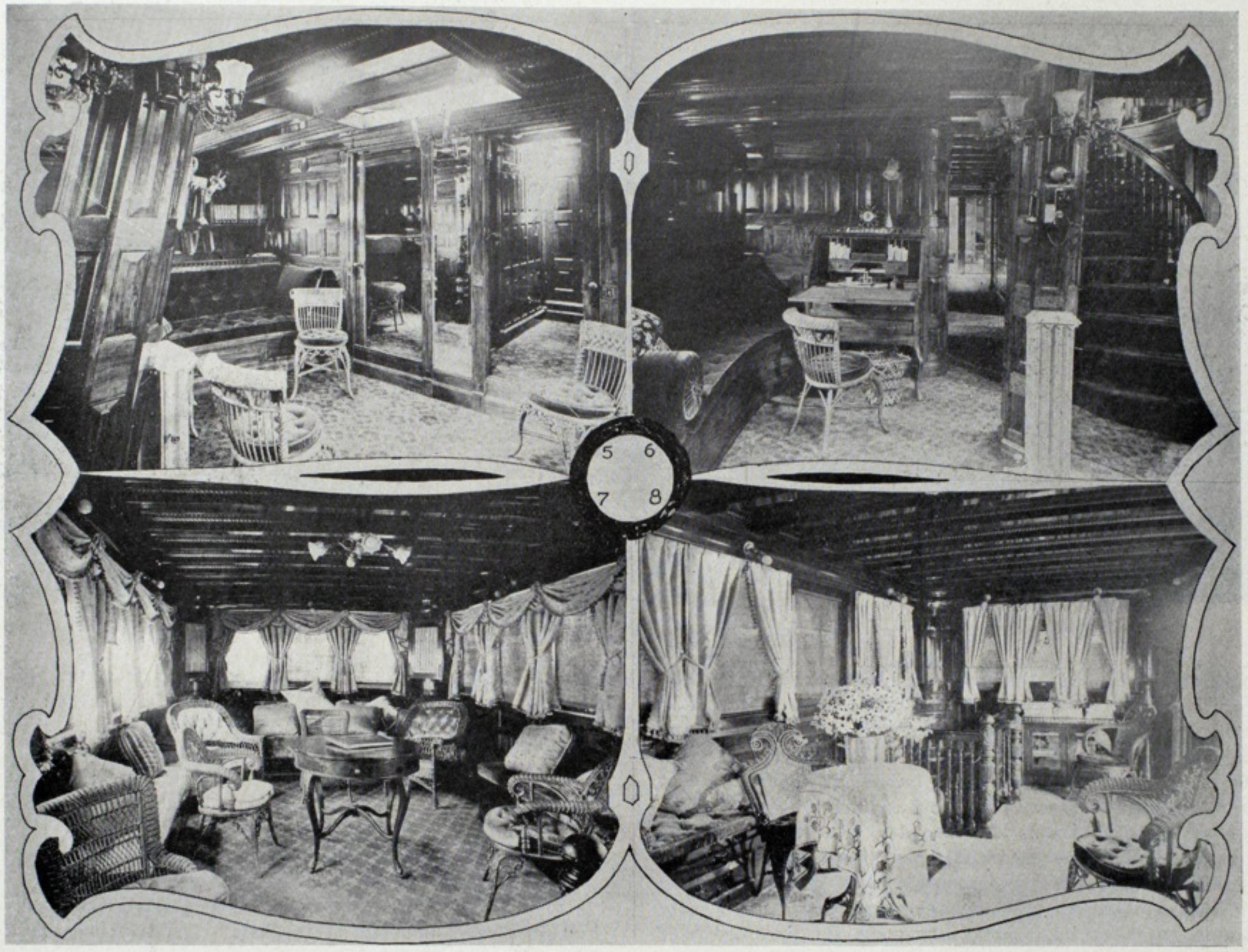
INTERIOR OF STEAM YACHT KANAWHA.

1. Guests' Stateroom.
2. Owner's Stateroom.
3. Dining room.
4. Music room.

wash basin, racks, etc., and the floor and sides are tiled. A passageway fore and aft extends between these rooms, finished in white mahogany.

Aft of the three guests' rooms is the main saloon and aft of this are two more guests' staterooms finished in sycamore, arranged side by side with sliding door between. Each room provided with a single berth with drawers under same and dressing case with mirror. Each of these rooms has a door from the main saloon.

Directly aft of these staterooms is a toilet room the full width of the vessel with a door from each of the two state-



INTERIOR OF STEAM YACHT KANAWHA.

5. Saloon, looking aft, showing Entrance to Guests' Stateroom.
6. Saloon, looking forward, port side.
7. After Deck house, looking forward.
8. After Deck house.

rooms. This toilet room is fitted with water closet, wash basin and bath tub and case of drawers. Aft of this toilet room is the lazarette arranged for the storage of ropes, etc., with racks arranged for storage batteries. Entrance to this compartment is through a brass deck plate.

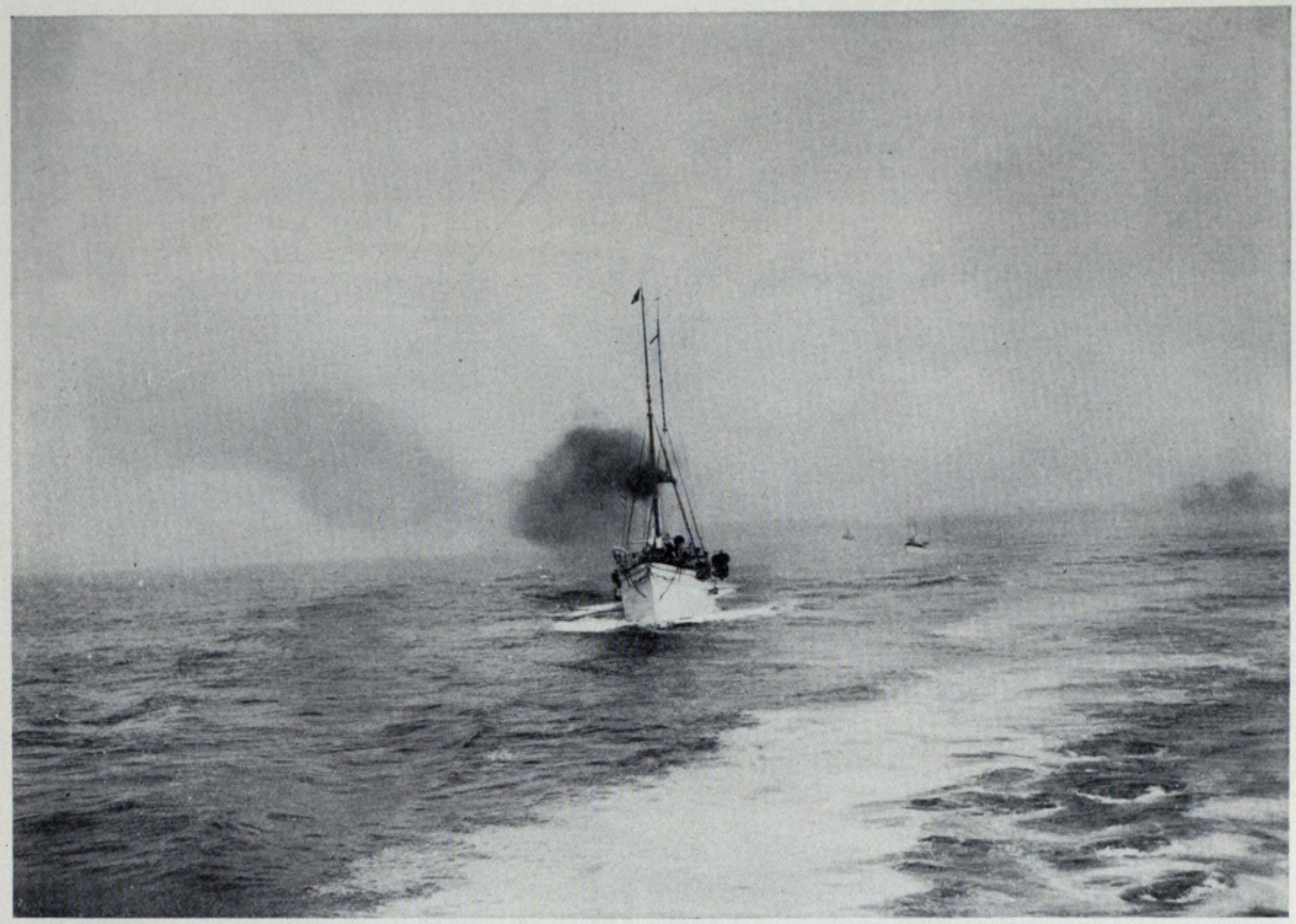
Steam heaters are arranged in the forward deck house, captain's stateroom, after deck house, and in saloon and owner's room.

Directly aft of the chain locker in the forward part of the vessel is the forecastle fitted with folding berths, lockers and table for crews' mess. In the after part of this compartment is a water closet and wash basin for the crew. In the forward part is a bath and toilet room. The forecastle extends the full width of the vessel and is ventilated with skylights and port lights. Each berth is provided with a mattress. The officers' quarters aft of the forecastle consist of four staterooms fitted with double berths and a mess room. The engineer's and mate's rooms are each provided with desks. A large bath and toilet room is provided for the officers also. Entrance to the officers' quarters is had by a separate companionway from the deck.

The galley is directly aft of the officers' quarters and is connected with one of the blowers to exhaust the hot air. The galley extends the full width of the vessel and is fitted with a large Bramhall, Deane & Co.'s range with two fire boxes, three ovens and a separate charcoal broiler, two sinks plumbed for hot and cold water, cupboards, lockers, etc. Connecting with the galley on the port side is a large icebox and next to this a large store room. The galley, crews' and officers' quarters are all finished in butternut.

The machinery equipment consists of two Seabury triple-expansion engines each 14½ in., 24 in. and 42 in. by 24 in. stroke.

The cylinders are made of a fine hard grain cast iron. The beds are also of cast iron, very strongly webbed. The main bearings and caps are babbitted. The crank shaft is of solid steel in two sections. The valve connecting rods, valve crankshaft, main connecting rods, valve stems, piston rods, stanchions and other forgings used in the engines are of forged steel finished bright. The crank pin boxes are of bronze, babbitt lined. The crosshead connections are of bronze bearing metal of best quality. The intermediate and low pressure pistons are of steel and the high pressure of cast iron. The crosshead guides are of fine grained cast iron. Each engine is fitted with an oiling set with necessary oil



SIR THOMAS LIPTON'S STEAM YACHT ERIN.

tanks and pipes. The thrust bearings are independent of the main engines and run in oil. The cylinders are jacketed in mahogany with brass bands. Relief valves are fitted on top and bottom of all cylinders and to all the receivers. Each engine has a steam reversing engine. The air pumps are of bronze connected direct to the main engines.

A set of large blowers is arranged to force the boilers and four large admiralty pattern Blake pumps are installed, one of these being arranged and connected as a fire pump. There are also two centrifugal pumps to supply water to the condenser, one large bilge pump, one pump for the evaporator and one pump for distributing water to the different tanks about the vessel.

There are two electric light engines of Seabury design, capable of generating 150 16-c. p. lights.

There is also an evaporator capable of evaporating and condensing 1,200 gallons of water in twenty-four hours and a filter capable of filtering 600 gallons of potable water in twenty-four hours. There are four Seabury water-tube boilers in the main generating plant and one small Seabury water-tube boiler to run the evaporator and electric light plant while the main boilers are not under steam. These boilers were constructed to stand a working pressure of 250 lbs. per square inch, the tubes being of the best cold drawn seamless steel. The water heater is made of the best lap-welded pipe with heavy malleable iron fittings. All of the boilers are encased in steel jackets thoroughly lined and covered with asbestos and magnesia and fire bricks and have galvanized ash pans fitted with doors to close in case of any internal pressure such as might be caused by the rupture of a tube.

There is one smokestack connected to the four boilers; this stack is double, the inside stack being covered with asbestos, wired on. Two ash shutes are provided. There are two condensers each having 1,500 ft. of cooling surface, the tubes being of Benedict nickel. The line shafting is of forged steel fitted with bronze bushings at the bearings and zinc protecting rings to prevent corrosion. The propeller wheels are of bronze fitted on shafts with taper hole and fore and aft key with large cap nut on outer end. A brass chime whistle 6 in. in diameter and 3 ft. long is provided.

The electric lighting plant consists of two dynamos independent of each other, each capable of generating power for 75 16-c. p. lights. The engines and dynamos are connected to run direct and mounted on one base. The switchboards are of marble and are fitted in the engine room near the engines and dynamo and have mounted on them the necessary meters and rheostats for controlling the dynamos and all the switches for connecting with the different mains and charging and discharging batteries. All of the wires are carried in moisture proof tubing through the coal bunkers and through wood molding to match the finish of the various rooms, elsewhere. Fixtures and brackets for lights in the deck houses, staterooms, etc., are of oxidized silver and bronze. Four deck lanterns are used on the after deck and one for each companionway.

There is also carried on a platform on the foremast a searchlight of 2,000 c. p. Also a complete set of belt lights of 8 c. p. each, arranged to extend all around the awning of the yacht and across to the main and mizzen masts and down to the deck. Storage batteries are carried capable of supplying 50 16-c. p. lights for 10½ hours.

The crews' and officers' quarters are furnished with mattresses and pillows and bedding, the floors of the officers' staterooms being covered with Brussels carpet and the floors of the officers' mess room and crews' quarters with linoleum. Curtains on rods are fitted to all port lights. The forward

deck house is carpeted with Wilton carpet, as is also the captain's room and chart and smoking rooms, and the windows are hung with silk curtains and roller shades. The after deck house is furnished in a similar manner. All of the staterooms aft and the main saloon are carpeted with Wilton carpet and all of the port lights are hung with silk curtains on rods. Each bed is fitted with separate springs and mattresses. Plush covered cushions are also provided in all of these rooms, and silk portieres are hung at all the stateroom doors and in the main saloon.

On deck aft, a grating is provided for the stern and on this leather covered cushions are placed. Fifteen rattan chairs and eight rattan settees are used on the deck and bridge.

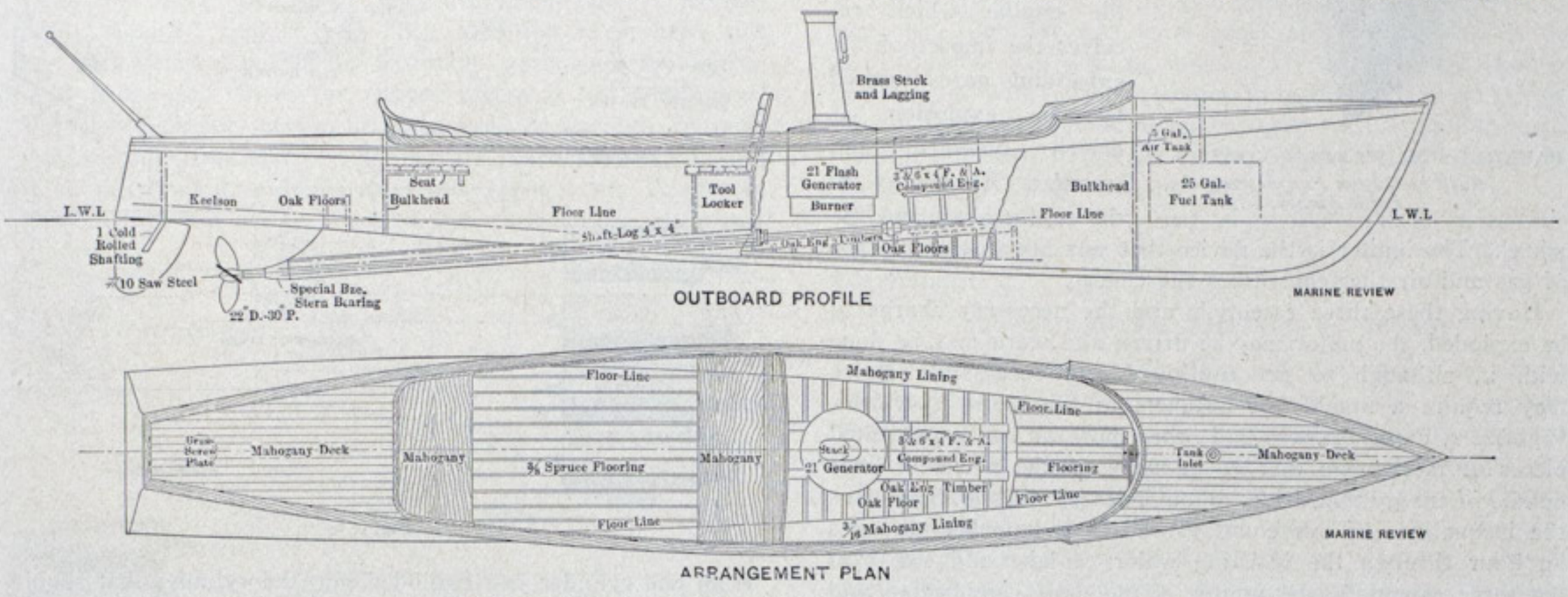
Six boats are carried on the davits, viz., one 30 ft. mahogany naphtha launch, smooth finished, with a canvas hood, one 20 ft. naphtha launch, one 23 ft. gig, one 20 ft. cutter, and two 18 ft. dingheys, all lap strake. The four large boats are finished in mahogany and the two small ones in ash. The four large boats have gratings in bow and stern and bottom and have cushions, rudders, brass yokes and backboards with name carved in same.

The yacht carries a crew of forty-two men, consisting of captain, first and second mates, boatswain, three quartermasters, ten sailors, one carpenter, chief engineer, first and second assistants, three oilers, two water tenders, seven firemen, chief steward, second steward, bedroom steward, waiter, chef, second and third cooks, pantryman and two mess men.

The Kanawha was guaranteed to maintain a speed of 22 miles per hour for two consecutive hours and to beat the steamer Monmouth. This guaranteed speed she has exceeded, she having maintained a speed of 24 miles per hour for two consecutive hours. It now remains to be seen whether the Kanawha can defeat the Hauoli (a yacht which came from the hands of her builders only last year) and hold the record for one more season.

STEAM RACING MOTOR.

The Palmer Boat Co., Highland Park, Ill., is building a racing motor from plans by C. M. Palmer for Mr. M. E. Mogg of Chicago for service on Geneva Lake, Wis. Her dimensions are as follows: Length over all, 28 ft.; length on the load water line, 27 ft.; beam at deck, 4 ft. 3 in.; beam at load water line, 3 ft. 8 in.; freeboard forward, 2 ft. 6 in.; freeboard lease, 17 in.; draught of hull, 15 in. The hull is planked with ⅜ in. white plank cedar with rock elm ribs. The inside work is of mahogany. Owing to the light weight of the hull the scheme of construction had to be carefully worked out in order that the hull might have sufficient strength to withstand the strain. Power will be furnished by a light weight fore and aft compound steam engine with a Barton 20-in. flashing steam generator (automobile) and Burnell kerosene burner. This outfit is expected to turn 22 in. bronze wheel of 36-in. pitch from 600 to 800 revolutions per minute.



ARRANGEMENT PLAN

STEAM RACING MOTOR FOR M. E. MOGG OF CHICAGO

[*Built by Palmer Boat Co., Highland Park, Ill.*

SMALL BOATS ON ILLINOIS AND WISCONSIN LAKES.

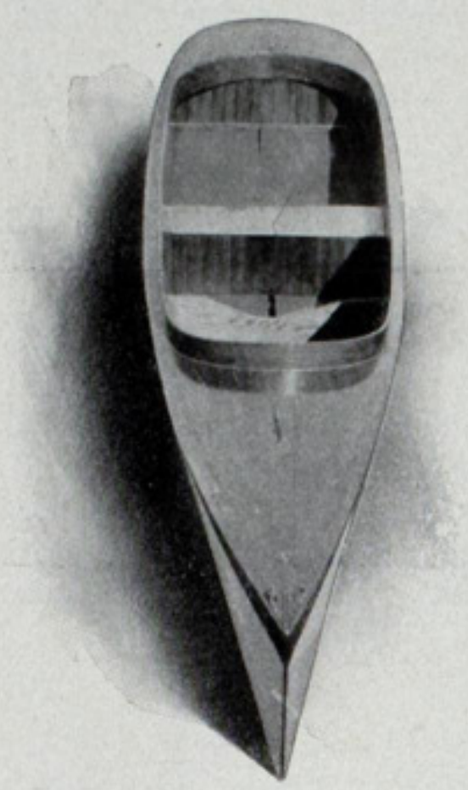
Chicago people who have summer homes on the inland lakes of Illinois and Wisconsin are yearly taking more interest in boating and a considerable part of this trade falls to the Palmer Boat Co., Highland Park, Ill. On Fox Lake, Ill., Arthur R. Jones, Thomas H. Miller, Jr., and Commodore C. A. Barnum of Chicago, will each have new boats of the 22-ft. cat class. The boats are racers of the latest type, equipped with bilge boards and furnished with hollow spruce spars and polished bronze metal fittings. Their dimensions are: length over all, 22 ft.; beam, 6 ft. 6 in.; sail area, 300 sq. ft. A racing 18-ft. sailabout of the bilge board type has also been put in the lake by Sath Catlin of Chicago. T. W. Browling and Adam Schillo of Chicago, have building 22-ft. cat boats similar to the Fox Lake boats for use on Pistakee bay. Charles J. Zahn of Chicago, will have a new racing sailabout on Twin Lakes, Wis., and Edward Walsher will enter a new 18-footer of the bilge board type for the races on Powers Lake. New boats for Dr. T. A. Davis and William Nieman of Chicago, are being built for the class of 18-ft. sailabouts on Dalavan Lake, Wis. John R. Williams and Charles H. Padgan of Chicago, will launch new boats in Geneva Lake. Mr. Williams' boat is very similar to the 22-ft cat boats on Fox Lake, except that her ends are raised up a little to make her more adaptable for rough water, and the boat building for Mr. Padgan is an 18-ft. sloop, to be fitted with double rudders and with bilge boards.

Among the motor craft is an automobile stern paddle-wheel boat for Mr. Paul Wenigman of Chicago, for use on Bluff Lake, Ill. The hull will have cross seats in the after cockpit and a revolving chair will be placed up forward for the man at the wheel. One person will be able to steer the boat and run the motor without assistance. Power will be furnished by a high speed gasoline motor. This boat is 35 ft. over all by 6 ft. beam.

A full train load of launches to be used in the lagoons at the grounds of the St. Louis exposition, has been shipped from the factory of the Truscott Boat Manufacturing Co., St. Joseph, Mich. The lot includes a number of new special designs.

THE IGNITION OF GASOLINE MOTORS.

By R. L. Hubler.



PAULINE FOR WARREN COWLES.
[Built by Dutton Engineering Co., Perth Amboy, N. J.

A noted educator once said that a university consisted of Mark Hopkins, a pupil and a log for them to sit upon. An internal combustion motor, of which the modern gasoline engine is the most common type, consists essentially of a cylinder, a piston and an igniter. The cylinder is that part of the engine which receives the impact of the expanding gases formed by the explosion, is driven outward and transfers its energy to the engine shaft and flywheel. The igniter is the device that sets fire to the mixture of gas and air that constitutes the charge.

Having these three essentials and the necessary charge to be exploded, the motor may be driven and work may be done with it, although to get continued and successful service may require a number of adjuncts in the shape of valves, vaporizers, crank-hangers and other more or less complicated pieces of mechanism that go to make up the powerful little bundle of energy that drives automobiles 90 miles an hour over the inequalities of our country roads and launches 30 miles an hour through the resisting water of lake and sea. On the three essentials, the igniter is the most complicated and has caused manufacturers and likewise owners of gasoline engines more trouble than the other two essentials, with all the non-essentials and extras included.

FORMER SYSTEMS OF IGNITION.

There are three obsolete methods of ignition that were formerly used on stationary engine, viz., flame, hot tube and catalytic.

The use of the flame consisted simply in the introduction of

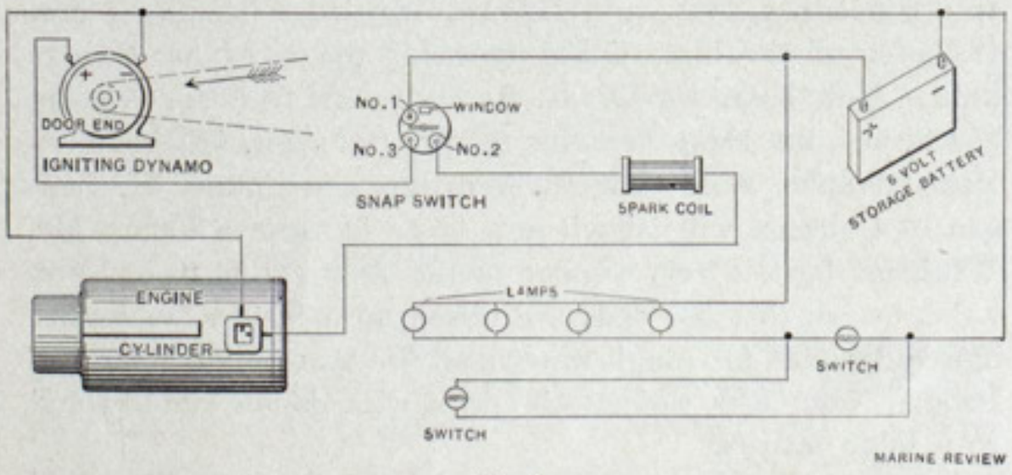


Fig. 1.

a jet of burning gas into the cylinder of the engine at the time an explosion was desired. It was very unhandy, impractical and expensive. The hot tube igniter consisted of a gas pipe of iron or composition, closed at one end and open at the other, the open end being threaded to permit of the tube being screwed into a hole leading into the cylinder or combustion chamber of the engine. By means of a gas jet, the tube was kept at a red heat and it would thus ignite the charge, as a portion of the latter was forced into the tube at each compression. Both the flame and hot tube have been discarded largely because of the impossibility of timing the ignition of the charge, but also because of the expense of the additional gas consumed and because of the danger attending their use. In quite a number of states, insurance companies have forbidden their use.

Catalytic ignition is that produced by high compression pressure within the cylinder. The first charges are ignited by using a torch to heat the cylinder or combustion chamber, after which the continued explosions keep it hot. This system is no longer used because of trouble in starting, but more especially because of the frequency of premature firing due to the heat evolved by the compressed mixture before the point of maximum compression had been reached. It might be stated that a recent revival of interest in flame ignition has been caused by the attempt on the part of a prominent French automobile company to utilize it, and in America too, one prominent racing man has devised a method of ignition of a multiple cylinder engine by conducting a portion of the burning exhaust gas

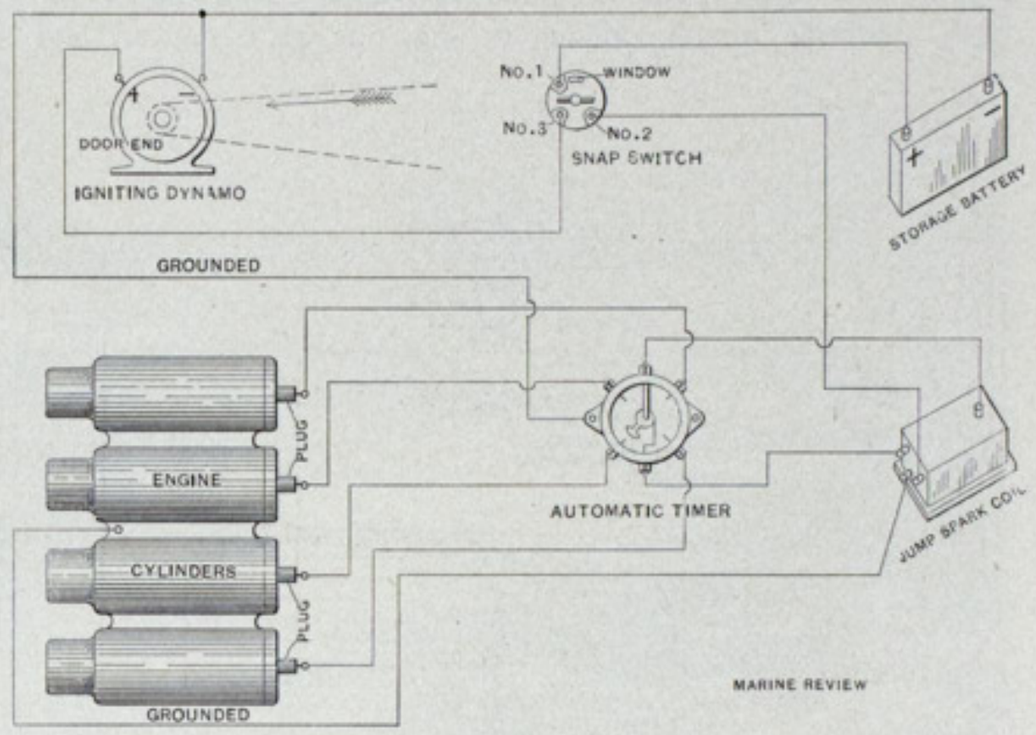


Fig. 2.

from one cylinder just exploded into the cylinder that should be ignited next.

The practicability of the device is yet to be shown, as it will be necessary to carry an electric ignition outfit for starting, and it seems very probable that the heat of the exhaust used will soon burn out the small and delicate valves used in the pipes carrying the burning exhaust.

ELECTRIC SPARK IGNITION.

Electricity has been chosen as an ideal igniting agent for several reasons. In the first place, the electric spark is very easily produced at any place it is needed, whether this be in a vacuum or in a cylinder fitted with a compressed mixture of air and gas. It may even be exhibited under water or oil or used to detonate a solid, such as gunpowder. In the second place the electric spark is more certain in its operation than the flame or hot tube. Again, the time of the spark and consequently the time of the explosion may easily be regulated. Further, if the proper equipment is provided, it is comparatively inexpensive.

As will be seen later, there are several systems of electric ignition, but they all have this vital point of similarity that by breaking an electric circuit within the combustion chamber of the engine, the particles of air and gas between the separated points or electrodes that are the terminals of the two wires forming the circuit, become heated to incandescence, and thus ignite the surrounding charge. There are two general classifications of the systems now in use, one depending upon the agent used for producing the current needed, while the other is based upon the particular apparatus used for applying the current.

HOW THE ELECTRIC CURRENT IS PRODUCED.

There are but two practical methods of generating current, no matter for what this is to be used, viz.: by chemical action and by mechanical generation.

The production of current by chemical action is seen in the

various types of electric batteries found in the market. The three types most commonly used for ignition work are the liquid sal-ammoniac, the bichromate of potash, or the caustic potash primary battery; the dry battery which contains a pasty electrolyte hermetically sealed in a zinc can; and the so-called storage battery or lead plate accumulator.

Of these three types the liquid primary battery is the most reliable, but is always subject to trouble and annoyance caused by the necessity of renewing its charge when the same has become run down or exhausted. It is, moreover, not adapted to use on automobiles or launches, because of its absolute lack of portability—the containing jars being exceedingly fragile, while the chemicals used give off noxious vapors when producing current, and are corrosive in their action on anything upon which they are spilled. Dry batteries are very often installed by motor builders as a part of the motor's equipment, and they possess several advantages over the other types that merit their use. They are small, light in weight, easily obtained, require very little attention when new, and are very serviceable for open circuit work such as ringing door bells, etc., where the electric strain is not continuous. For closed circuit service, as when used on gasoline engines, they are not so satisfactory, as they are practically continuously short circuited, and this soon runs them down. When exhausted they can not be renewed, but must simply be thrown

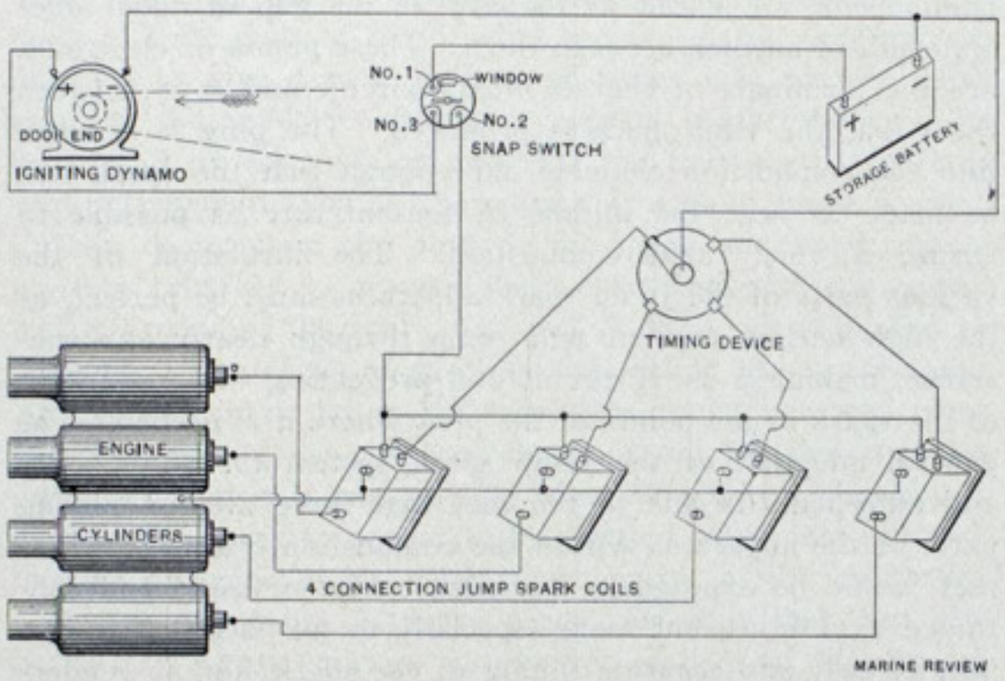


FIG. 3.

away to be replaced by new cells. In all instances where they form the sole source of current, at least two sets of about six cells each should be carried by the automobile or motor boat owner as he can never tell when they will become exhausted and leave him without the vital spark needed to start his engine. They may last half a season or they may last but two or three days. A mischievous boy with an inquiring mind and a piece of wire, can short-circuit and cause the premature death of the best set of dry batteries in an incredibly short time.

The storage battery or accumulator consists of two or more lead plates, coated with chemical salts of the same metal, contained in a glass, rubber or lead jar and using an electrolyte of sulphuric or hydrochloric acid and water. It is "charged" by passing a current from some source of electricity, such as a dynamo or a primary battery, through it. As the current from the external source passes from one lead plate through the acid solution of the other plate, electrolytic action takes place, or in other words the chemical lead salts are decomposed. When the decomposition is complete, the battery is said to be charged, for it is then capable of producing a current itself by a reverse chemical action that takes place and restores the salts to their original chemical structure, if the wires leading from the terminals of the lead plates are connected to complete the circuit.

This type of battery gives the kind of spark most desired for ignition work—one that is fatter and hotter than that produced by a set of dry batteries of equal voltage, as this insures better and more certain explosion than a weak spark. Storage batteries are used on nearly all the racing cars, either alone or in connection with a small ignition dynamo to recharge them as their current is exhausted. The latter manner of using it is the only really practical one, for if the storage battery alone is depended upon, trouble is often experienced in having the battery recharged, as this can be done by passing electricity from a direct current dynamo or from a primary battery through it, and these sources of current are often unavailable. They require considerable attention and care, and should be equipped with voltmeters and ammeters to show how much current they contain and how much is needed in recharging. They are easily damaged by overcharging by being discharged too rapidly, also by not being used for some length of time as the plates readily become sulphated, and will then not hold a charge.

The enclosed type of storage battery is much preferred to the open kind for use on launches and automobiles, as the acid solution may slop out and quickly destroys any wood or metal work with which it comes in contact. If the enclosed type is used, care should be taken to remove the top during the charging process to permit of the escape of the inflammable hydrogen gas that is evolved.

If this is not done there may be an explosion, or at least the sides of the containing cell will be badly bulged and the plates disarranged.

THE MECHANICAL GENERATION OF CURRENT.

For street car, electric lignting and other heavy service requiring the production of current in large amounts, the dynamo is always used. Even the most inexperienced electrician would not dream of using primary batteries for such work, and storage batteries are equally unavailable because of expense of maintenance and uncertainty of operation. As a source of current for ignition, a small dynamo or a magneto may be used fully as satisfactorily as larger generators for power service, and they have many advantages over batteries that must be noticed.

Ignition dynamos and magnetos are generally of the direct current type and differ only in respect to the kind of magnets used, the magneto being provided with so-called "permanent" magnets, while the dynamo uses electro-magnets or those formed by passing an electric current through a coil encircling an iron core. The magneto is a less expensive generator than the dynamo, and is not so satisfactory as the latter as it gives a smaller output of current and can be used for the make and break or contact system of ignition only, while the dynamo will operate all systems successfully. The magneto, moreover, is always subject to the possibility of losing the magnetism of its "permanent" magnets, and the latter must then be returned to the manufacturer for remagnetization.

The ignition dynamos now found in the American market are marvels of compactness, reliability and efficiency. Some of these, occupying a space about 6 in. high, 6 in. wide and 11 in. long, give an output of ten volts and four or five amperes. They are completely enclosed, so as to be water, dirt and dust proof, and require no attention from the operator beyond the insertion of new commutator brushes probably once a season. They give a current of more constant pressure than batteries, for the voltage of the latter soon drops below what it is rated, the strain of continuous closed circuit work soon making its effects noticeable. Very little of the engine's power is needed for running them, and the power of the engine is really increased by the use of the dynamo, because of the fact that the abundant and never failing supply of current makes better and more certain explosions than those caused by battery current.

There are several types of governing devices for regulating the speed of the dynamo when used on variable gasoline motors, so ingenious as to attract attention. They all depend upon centrifugal force acting upon weighted arms. When the

speed gets beyond normal, these arms or small levers automatically move the pulley away from its contact if of the friction clutch type, or permit the driving band of the pulley to slip if the governor is of the belt clutch type, and thus retard the speed of the dynamo although the engine may be running at its maximum speed.

If the dynamo is equipped with a governing device, it is generally possible to start the engine direct from the dynamo by giving one or two quick turns to the flywheel, and when the engine reaches its maximum speed which ordinarily would be so great as to cause burning out of the dynamo, coils, and sparking points, the governor keeps the dynamo running evenly and smoothly at its rated speed. In some instances it is desirable to carry a set of dry batteries, or a storage battery, for emergencies and also for starting the engine if the flywheel turns hard, as this will save the preliminary cranking necessary to generate the first spark from the dynamo.

An excellent outfit for launches consists of an enclosed dynamo used in connection with a six or eight-volt storage battery, as it will not only furnish ample current for ignition purposes, but will also light three or four small incandescent lamps that may be used for illuminating purposes. Nearly all the European manufacturers of launches and automobiles equip their engines with ignition dynamos and magnetos, and it seems only a question of time until the American builders will also furnish them regularly as a part of their engine's equipment. The high-powered and high-priced motor boats are in nearly every instance thus fitted out, and it has merely been a matter of the additional expense involved that has prevented the general use of mechanical generators on smaller and less expensive boats.

Fig. 1 shows a wiring plan for using a dynamo and storage battery for igniting a one-cylinder "make and break" system engine while also lighting four lamps. This electrical equipment is so simple that any one of a mechanical or electrical turn of mind could install it in his boat himself, if the latter was not thus equipped when purchased.

HOW THE CURRENT IS APPLIED.

There are three methods or systems of applying the electric spark within the cylinder or combustion chamber of a gasoline motor, viz.: (1st) the jump spark, (2nd) the make and break spark, (3rd) the magnetic plug or impulse spark.

The jump spark system, although of but recent application, having been used only during the past two or three years, is the one in most general use on high-speed engines.

The apparatus required consists of (1) a dynamo or a battery as a source of current, (2) a secondary coil, (3) a timing device and (4) a jump spark plug.

The dynamo as described earlier in this article, should be of the shunt-wound, direct-current type, and the magneto type of generator should never be tried for this work, because of its slight amperage and unreliability. The battery should be of the dry cell type, six or eight cells being connected in series, or a six or eight-volt storage battery of at least twenty ampere-hour capacity. The secondary or jump-spark coil consists of two windings around a core of slender soft iron rods; one winding of heavy copper wire that forms the primary circuit encircling the core yet being separated from it by some insulating material, while over the primary coil and also separated by insulation is the secondary coil proper, consisting of many layers of very fine, silk-covered copper wire.

The current from the dynamo passes through the primary circuit of the coil and this induces a current of such high potential or great pressure in the secondary winding that if the two ends of the fine silk-covered wire are brought nearly together, the secondary or induced current will jump through the air from one to the other, and it is this spark which is used to ignite the charge in the cylinder. A vibrator or trembler is used on the coil to cause rapid interruption in the primary circuit. As the primary current is interrupted, there is an increase in tension in the secondary, so that the current at the terminals will leap across an air gap of considerable size. The vibrator is generally operated magnetically by the coil itself, but sometimes it is actuated mechanically by a cam forming part of the timing device.

As the explosion of the charge must take place exactly at the moment of maximum compression, a device is required for timing the spark, which ignites it. This is accomplished by opening and closing, mechanically, the primary current before it passes into the coil.

Fig. 2 shows an ordinary timer used on a four-cylinder engine with four coils.

As the speed of the engine increases or decreases, the spark must be produced earlier or later, and this is accomplished by moving the contact brush forward or back from the position in which it touches the segments of the timer's commutator at normal speed.

Fig. 3 shows a more complicated automatic timer, which not only times the interruptions in the primary circuit, but also distributes the secondary current so that but one coil is needed for use on a two, three, or four-cylinder engine. The jump spark plug consists of a metallic core and a metallic shell or outer covering, with porcelain or mica insulation separating them. The two metallic portions of the plug are each provided with a platinum or composition point, these points being so placed as to have an air gap of about one-sixteenth of an inch between them. These points or electrodes are the terminals of the secondary circuit and it is between them that the vital spark is produced. The plug is screwed into the combustion chamber far enough that the spark will be made as near the middle of the mixture as possible to ensure a very rapid combustion. The insulation of the various parts of the jump spark apparatus must be perfect, as the high tension current will jump through nearly any substance, making a short circuit and preventing the appearance of the spark at the points of the plug where it is needed. The general adoption of the jump spark system for automobiles and auto-boats is due to the fact that there are no moving parts of the apparatus within the combustion chamber, where they would be exposed to the intense heat of rapid and continued explosions, but more especially to the fact that it permits of easy and accurate timing of the spark, and so renders unlikely premature explosions and back-firing.

THE MAKE AND BREAK SPARK.

The make and break spark apparatus consists of (1) a dynamo, a magneto, or a battery as a source of current, (2) a primary coil, and (3) a device for separating and bringing together the points or electrodes within the combustion chamber. The coil consists of a winding of heavy copper wire, well insulated, around a core of soft iron wire. The make and break device is actuated, mechanically, by a cam on the engine shaft, the cam moving a lever that puts the electrodes in contact. At the moment of separation of the points the current arcs from one to the other, and this miniature arc light or spark ignites the explosive mixture.

By having a coil of low resistance, a contact device that permits of rapidly opening and closing the circuit, and an abundance of current such as is furnished by a good mechanical generator, the make and break system furnishes an almost ideal spark, of the "fat" and hot variety so much sought for by gas engine manufacturers.

The only objections to the make and break system are the difficulties of timing the spark and the fact that the movable points inside the combustion chamber soon burn out when exposed to the intense heat of the rapid explosions of a high speed motor.

THE MAGNETIC PLUG.

This system uses a source of current similar to the two systems mentioned above, a timing device identical with that of the jump spark, and a plug that has movable electrodes

actuated by a magnetic impulse produced by passing the current through an electro-magnet contained within the plug itself. It furnishes a heavy yellow spark of superior quality, but is subject to the troubles incident to the use of working parts within the cylinder where they are exposed to excessive heat.

This impulse system is yet in an experimental stage, and it is possible that the magnetic plug may be developed into a very practical device, as a number of leading igniter manufacturers are working upon it.

IGNITION TROUBLES AND SOME REMEDIES.

An inferior ignition outfit is generally the source of more trouble than all the other parts of the motor put together. If the manufacturers of your engine saved some money for themselves by giving you a cheap outfit, it will pay you to throw it away and buy a good one. If your engine is large and the fly-wheel turns with difficulty, buy a good dynamo and storage battery, while if it is of 10 H. P. or less, a simple dynamo fitted with a governor will perform all the functions of an expensive battery, and should pay for itself within a year by saving battery renewals.

If you use a dynamo, see that the brushes make good contact on the commutator; that the latter is kept free from oil and dirt, and that all the wires of the complete apparatus are firmly attached to the binding posts where connections are made. If the ends of the brushes become glazed they may be filed off to give a new surface of better conductivity. See that the timing device furnishes a good contact between its brush and its commutator and that the time of the spark is well retarded in starting the engine, if a hand timer is used. Carbon deposits on the plug or the make and break device must be removed to prevent short circuiting with consequent disappearance of the spark, and this is easily accomplished by applying a few drops of gasoline and setting fire to the same. An external spark gap in the secondary circuit has been much exploited during the past year as a cure-all for fouled sparking plugs, and it is undoubtedly often of marked efficiency in causing the spark to appear at its allotted place notwithstanding the presence of a carbon short circuit at the electrodes.

If you are using batteries alone, see that they are kept charged, if of the storage battery type, while if of the dry-cell variety and they are exhausted, throw them away and buy new ones. Sometimes, however, a set of dry batteries may seem to be exhausted when really there are only one or two cells dead. If these are replaced by new ones the entire set will again be serviceable.

Take a pride in mastering the details of your motor. Read the catalogues and instructions furnished by the makers of the various parts of the engine, and if you will give the latter just a little intelligent care and attention, you will find it very capable of rendering you efficient service at all times.

SEA ANCHOR USED BY CAPT. NEWMAN CROSSING THE ATLANTIC IN ABIEL ABBOTT LOW.

KEROSENE OIL ENGINES

The New York Kerosene Oil Engine Co. is meeting with considerable success in exploiting their kerosene oil engines. Improvements have lately been made in them by which the engines can be started immediately and run either by spark or automatic ignition. The company believe that it has now an engine inferior to none on the market. The engines and launches of this company are in use in West Indies, in South America, and Australia, and duplicate orders from these points are a proof of the satisfaction derived from them. The company has now orders on its books for engines to be shipped for installation for boats in China. The item of safety is the use of kerosene oil. The fact that kerosene can be obtained in many places where gasoline cannot be purchased has done a great deal to popularize this engine in Latin-American countries and in the far east. A 38-ft. boat built by this company, the Abiel Abbott Low, crossed the Atlantic propelled by one of the company's 10 H. P. engines. Regarding the performance of this vessel the company has lately received a letter of which the following is a part: "I crossed the Coral sea to New Guinea and worked over 600 miles of the coast, total mileage, 900 miles; longest run, 57 hours; no stop, and the whole run without a hitch of any sort." The company has lately given much attention to designing the engines with a view to decreasing the cost and weight by simplifying and eliminating various parts. It maintains that the new engine will be superior in all respects to any motor using kerosene as fuel.

NEW YORK KEROSENE OIL ENGINE CO.'S LAUNCH.

NEW YORK KEROSENE OIL ENGINE CO.'S LAUNCHES.

The Huntington Mfg. Co., New Rochelle, N. Y., is building a 45-ft. launch for Mr. Trena L. Park of the Larchmont Yacht Club of New York.

DEVOTED TO EVERYTHING AND EVERY INTEREST CONNECTED
OR ASSOCIATED WITH MARINE MATTERS
ON THE FACE OF THE EARTH.

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MAY 5, 1904.

The Gardner bill to appoint a commission to inquire into the state of the American merchant marine with especial reference to the foreign trade passed the senate during the last day of the session and was promptly signed by the president. The commission will be composed as follows: Senators Gallinger, Lodge, Penrose, Martin and Mallory and Representatives Grosvenor, Minor, Humphrey, Spight and McDermott. Sub-committees of the commission have been appointed as follows:

For the north Atlantic coast—Senators Gallinger, Lodge and Penrose and Representative McDermott.

For the Pacific coast and the great lakes—Representatives Grosvenor, Minor, Humphrey and Spight.

For the south Atlantic coast and Gulf of Mexico—Senators Martin and Mallory and Representatives Minor and Spight.

The commission has appointed Mr. Winthrop L. Marvin as its secretary. Mr. Marvin is well versed in merchant marine history and legislation, and as his training has been of the finest character, he will doubtless make a first-class secretary. The commission will hold its first meeting in the rooms of the Chamber of Commerce in New York on May 23rd at 2 p. m. Extensive hearing will be given to those interested in the proposed legislation before the commission attempts to frame a measure. In addition the sub-committees will make personal visits to those parts of the country for which they have been specially selected.

It appears that the old question as to whether a man who holds a government license can be compelled to work is again to be revived on the great lakes. A moment's consideration ought to convince any one that a license is merely the badge of competency. It simply says that the person holding it is competent to perform the labor for which it entitles him to perform. It does not make work obligatory. In a free country no man can be obliged to work at any calling unless he desires to work. It is just as senseless to hold that a licensed officer should be compelled to work aboard ship as it would be to hold that a physician who has received his diploma should be required to practice medicine or a minister who is ordained should be required to preach. Any other ruling would make the license not only the badge of competency but that of slavery as well. By the same token no man who wants to work should be restrained from doing so. The right to work without fear of intimidation from any source whatever is a natural and sacred one and should be guaranteed to every citizen under law; the right to voluntarily suspend work is equally natural and sacred. Trouble comes when coercion is exercised and it is equally as bad for the employer to endeavor to force a man to work merely because he holds a license as it is for a union to intimidate those who desire to perform work which they are unwilling to themselves perform. If any vessel owner is seeking to make a member of the Masters & Pilots association work because he is a licensed officer he is doing quite as foolish a thing as the masters are in denying the right to the owners to remove them should they not desire their services.

The present impression of the Marine Review is devoted, as will be observed, to gasoline launches, motor boats and pleasure craft. It will be the purpose of this publication hereafter to give as much space as the subject warrants to this class of craft. The field is at present a large one and is undoubtedly a growing one. Even so great an authority as Sir William Henry White, late chief constructor of the British navy, says that the usefulness of the gas and oil engine for marine propulsion is only beginning. To keep abreast with the progress and development of this type of engine will be one of the aims of the Marine Review. Up to the present time the gasoline engine and its application to marine propulsion has been devoted largely to pleasure craft, but its future in a commercial sense is undoubtedly a large one. The Review will cover every phase of the development of this type of craft in a series of authoritative and careful articles. The commercial possibilities of this type of engine are many. In Great Britain especially is its adaptation to canal craft a subject of serious consideration. Notwithstanding the violent assaults made for many years upon the canal system of Great Britain by the railways,

the great framework of the system is practically unimpaired, that is to say these waterways exist quite as completely today as they ever did.

"THE MAN AT THE WHEEL."

At last.

Something, (not much, it is true,) has been done in the way of recognizing the claims of the shipping interests of America for a little of that generous attention so lavishly dealt out by our law-makers at Washington to other interests —when the proper influence has been exerted.

Of the three bills which have received such reluctant consideration, the one which simply provided for a committee of five senators and five congressmen to make an examination into the merits of this great question and, if possible, unite upon a report that would foreshadow some sort of feasible legislation that might meet with universal approval, was as bitterly antagonized as any.

The inglorious spectacle of a congress that had just voted appropriations amounting to $781,574,629, hesitating about an allowance of $20,000 to pay all of the expenses of this committee which will visit every leading port and marine center as well as the Great Lakes region, and secure a vast amount of testimony which must be afterwards completed and put into shape and submitted to all the members of both branches of our national legislature in the form of a printed report, is the most discouraging outlook possible for a future that it was hoped might produce some legislation of a patriotic character.

What is there about this proposition anyhow that has made this question for the first time an extremely partisan one?

What is there that makes congressmen fight like a lot of wild men against the gathering by a non-partisan commission of some data or evidence that would permit of intelligent action by the parent legislature later on?

What is there about it all that will not bear the light of day?

What is there about the humiliating statement that the American ship and the American flag on the ocean is getting to be as rare as the Mastodon Pachyderm or the Dodo that there should be a few people who apparently have a tremendous interest just at this time in having all the facts concealed?

There is something behind all of this, something that will not stand the light, something that is as disgraceful as it is iniquitious, and it may be disclosed yet, as it is more than half suspected now.

And then to think of the crazy anties of some of these gentlemen who have voted millions for subsidies to railroads for performing indifferently and at an exorbitant price, certain duties, in proposing a resolution to the effect that this committee should not bring in any report that would favor a subsidy or financial support of any kind whatever to the American merchant marine.

Foolish.

Foolish in many ways.

This committee was primarily appointed to get all the facts for congress and those congressmen who wanted the truth with reference to every phase of this all-important and much discussed subject, and how could this be done if they were handicapped in their investigations at the beginning, concerning any feature of the work in hand, even if no subsidy legislation is anticipated or possible.

Let us have all the facts. Keep nothing back.

If the subsidy idea is a good thing this country wants to know it. If it is not let us all unite to forever put it to sleep and get busy upon something that is practicable; but this could never be done if the committee at the outset were prevented from getting the facts.

This prevention would naturally forever keep alive the subsidy question, and as a matter of fact would operate in a manner directly opposite to that desired by those who advocated the proposition of not discussing the subsidy question in any way.

Evidently there were some people who could not trust the committee, and moreover, who were afraid, apparently, to trust the people who might have something to say when they were placed in possession of all the facts from an unprejudiced source. Otherwise why so anxious to suppress the truth?

This publication does not know whether the subsidy idea is the proper thing or not.

Very likely it is entirely wrong. If so it must be gotten out of the way before anything is done and it cannot be put aside until the country is satisfied that it is not feasible.

But we want to know, we expect to know, and hundreds of thousands of good American citizens likewise feel as if they would like an opportunity of getting at the truth and have it freed from the miry influence of partisan politics.

But this again is contrary to the wishes of apparently the same crowd who want to keep the question alive and to prevent anything from being done one way or the other.

Perhaps there may be some peculiarly special reasons for tnis anxiety on their part to juggle with it interminably.

And so a roll call in the house was ordered on the motion to make those who favored getting at the facts go on record, and the resolution was so cunningly worded as to make it appear that they who voted in the affirmative might in some way be regarded as being pledged to some future form of legislation or some bill that possibly might be introduced later on.

Foolish again.

As a matter of fact those who favored the resolution only placed themselves upon record as being opposed to the truth, opposed to an investigation, opposed to the exact conditions becoming known, and opposed to everybody and everything except conserving the interests and the profits of the foreign ship owners.

Yes, they got the "record" all right, and put a weapon into the hands of their enemies of which they will hear more before the close of the present year.

See if we are not right.

Foolish. Very foolish.

How the majority must have grinned as they saw the minority tumble into a trap of their own building!

In every issue affecting the honor of the country and the flag, that has arisen in America since the day of the Boston tea party to the present hour, there has been a section of the country always "agin' the government," who have opposed the popular, patriotic, honest, just action of the majority.

We had them in 1776, in 1812, in 1861, and at a host of other dates between those years and since—we probably always will have them; but what does posterity think of them? Where do they stand now?

Even the children in our public schools can answer, and later on there will be added to the roster, those who have opposed doing something to prevent the American flag from becoming extinct upon Nature's own highways, the oceans and seas of the world.

Think it over.

It is its merchant marine that has made Great Britain the world power it is. Germany, France, Norway and Japan are coming rapidly to the front while the stars and stripes is dropping out of sight.

Advantages of Gas and Oil Engines for Marine Propulsion.

By John E. Thornycroft.

Thornycroft's Racing Launch Scolopendra.

It has been recognized for some time by engineers who have to do with large power installations for land purposes that the reciprocating steam engine has been developed to a stage that cannot easily be improved upon, and that if greater economics are required they must look either to the steam turbine or the internal-combustion engine. Naval architects and marine engineers have been quick to take up the steam turbine; but although the internal-combustion engine has been developed to a high degree of efficiency on land, it has, up to the present time, only been used to a limited extent for marine purposes, and then only for driving launches and small craft. The advantages which oil and gas engines offer are so great that it is difficult to understand why they have not been more largely used. They necessitate the employment of some complications which steam engines avoid, but the one great advantage of their requiring neither boilers nor condensers will, it is thought, be found to more than compensate for these complications. Before making a direct comparison it will be well to consider the different systems, and the way in which they work.

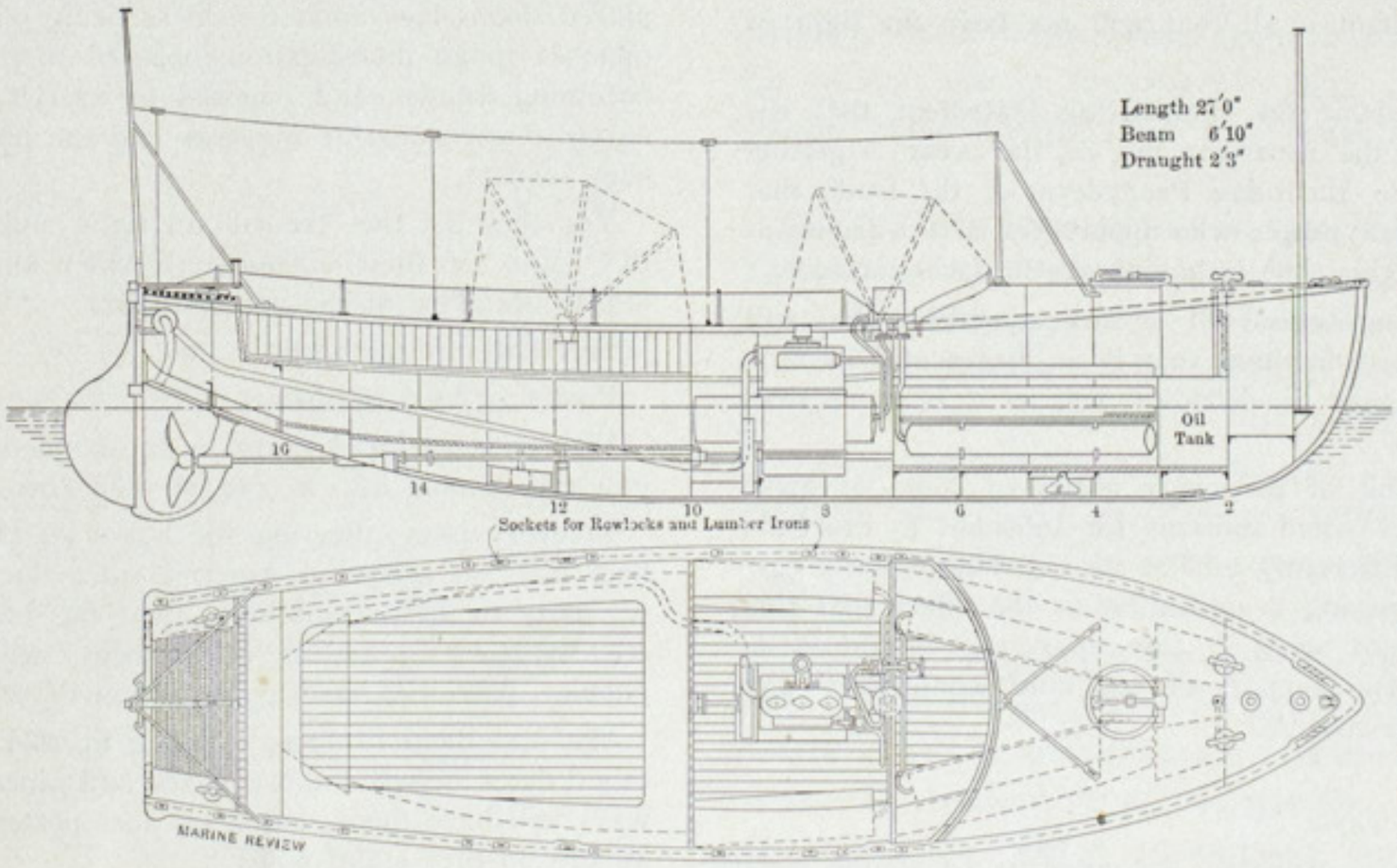


FIG. 1. 27-FT. CUTTER FITTED WITH REVERSING PETROLEUM MOTOR. THE SPACE OCCUPIED BY THE MOTOR IS EXACTLY HALF THAT TAKEN BY STEAM MACHINERY IN SERVICE CUTTERS.

CLASSES OF ENGINES.

Internal-combustion engines may be divided into several classes, according to the fuel they employ:

1. In which the combustible employed will vaporize at atmospheric temperature.

2. In which the combustible requires vaporizing by heat or by spraying.

3. Gas engines, using gas from some form of producer using solid fuel.

1. Engines of the first type.—The Diamler motor is representative of the first type, and practically all of the engines working on the Otto cycle with this class of fuel are developments of Diamler's original engine, and are the simplest and lightest of the different types, as the fuel, in the form of petroleum spirit, is drawn into the cylinder with the amount of air necessary to burn it by the suction stroke of the engine. The apparatus for mixing the spirit with the air is of a very simple character, and the class of fuel permits of a high degree of compression being employed without danger of premature ignition; this high compression produces a high explosive pressure, and the cylinders of the engine are small in proportion to the power, and so the engine is light. Engines have been made by the German Diamler Co. up to 300 B. H. P., by several American builders up to 150 B. H. P.,

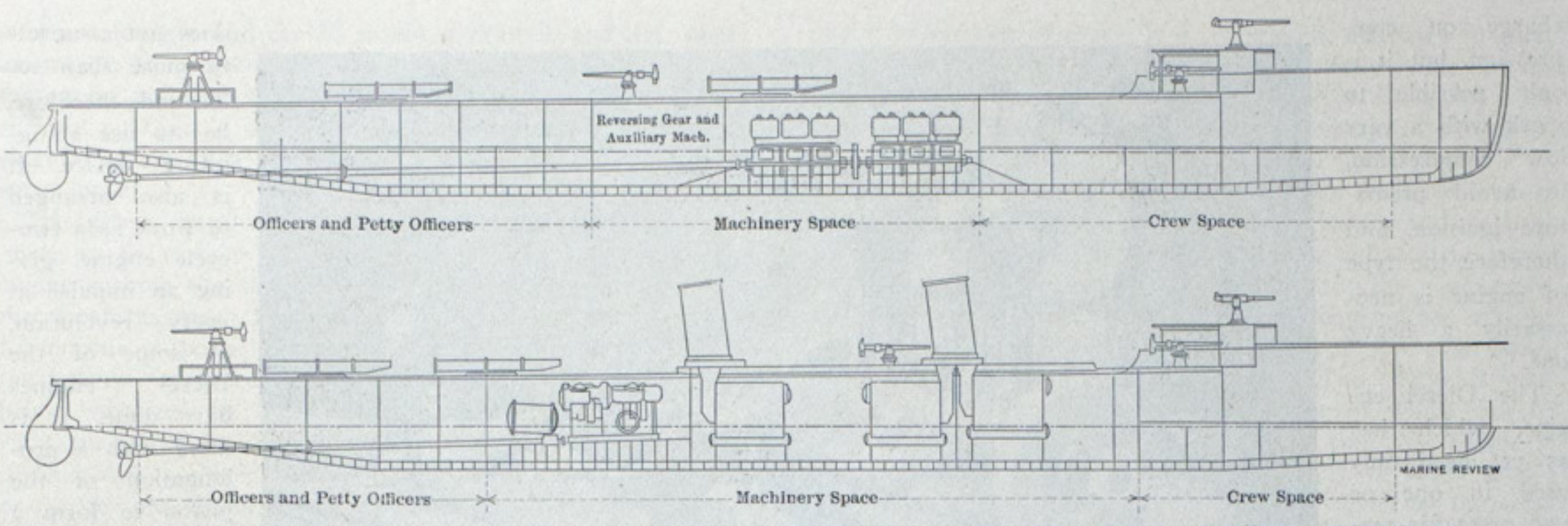


FIG. 2. DIAGRAM SHOWING RELATIVE SPACE OCCUPIED BY STEAM AND INTERNAL COMBUSTION ENGINES OF 6,000 I. H. P. FOR A DESTROYER.

and by Messrs. Vickers, Sons & Maxim up to 300 B. H. P. for British submarines.

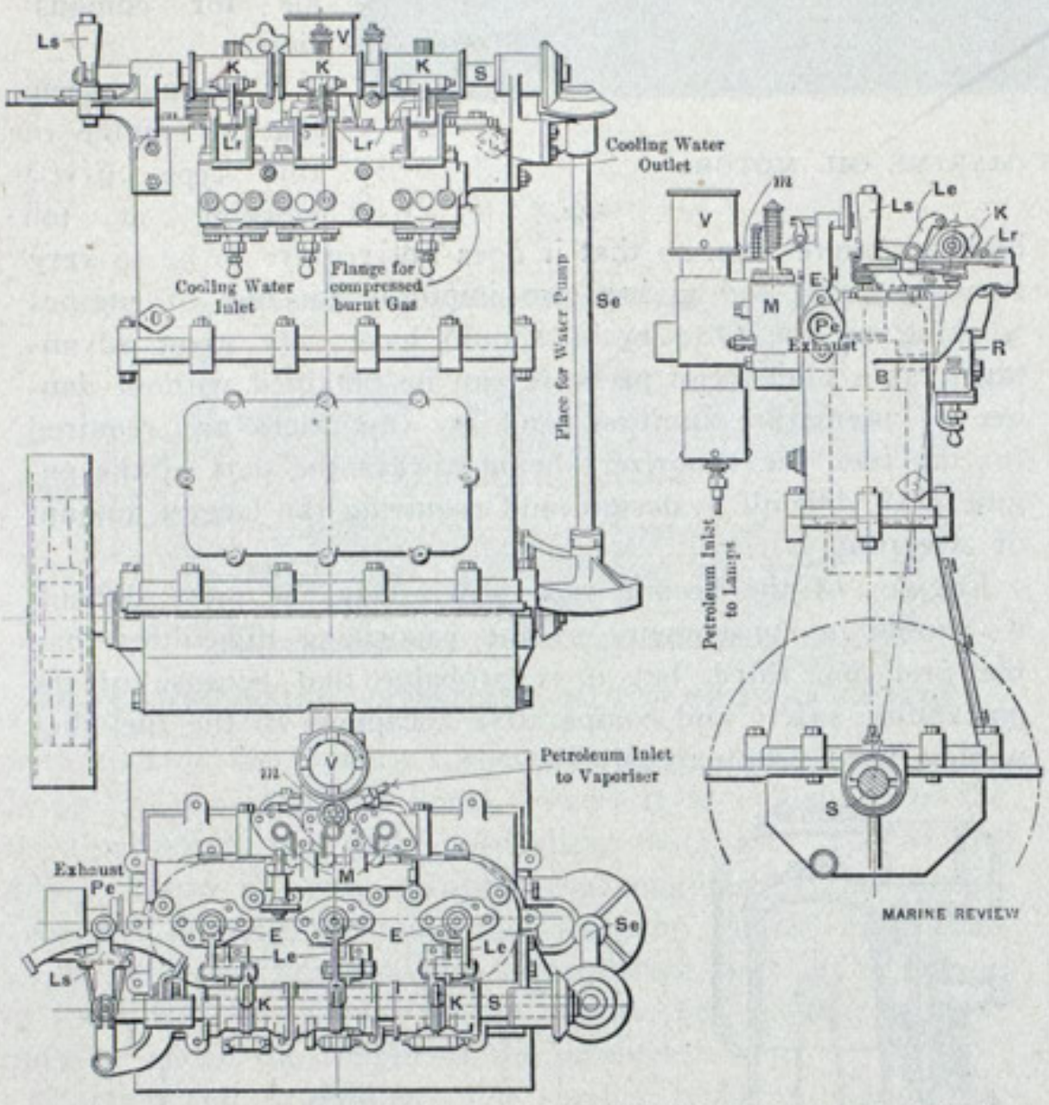


FIG. 3. REVERSING PETROLEUM MOTOR OF 27-FT. CUTTER.

Most of the leading motor-car builders, both on the continent and at home, have built engines of considerable power of this type, which have been fitted to launches. In America there are a number of firms building smaller types of engines which do not follow the Otto cycle, but give an impulse at every revolution, by using the under side of the piston and crank chamber for pumping the charge of explosive mixture into the cylinder. This type cannot be run at a high speed, and is not suitable for large powers.

Engines of the second type.—There is a much greater variety of engines coming under the second heading, as the difficult problem of vaporizing the fuel has been treated in a variety of ways by different builders. The stationary oil engines have been made very perfect for work where there are no very rapid or great changes of load, but for marine purposes, where a considerable amount of variation takes place in maneuvering, the problem becomes much more difficult. Most of the engines work on the well-known Otto cycle, and the variations occur in the different methods of introducing the fuel and vaporizing it. In the case of the Priestman and Griffen, two of the earliest, the fuel is sprayed by air pressure into a vaporizer heated by the exhaust products, and then taken up into the cylinder on the suction stroke. In the Vosper and Root's engines it is either pumped or measured into a vaporizer without being sprayed.

In the Hornsby the oil is pumped directly into an extension of the cylinder, which is maintained at a high temperature, and the air is introduced separately. This method has the advantage of great simplicity, as no igniting device is required, as the heat of this chamber is sufficient to ignite the

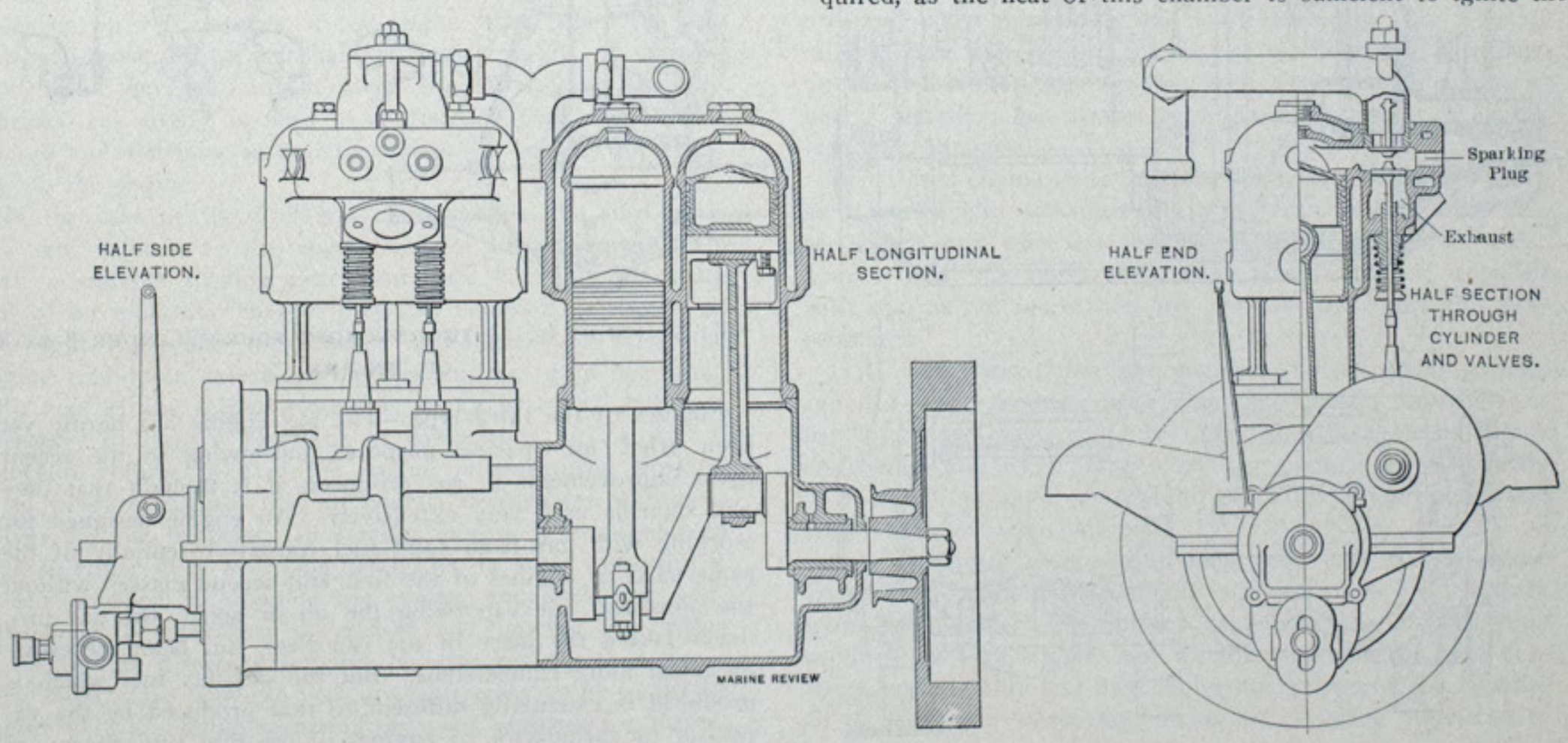
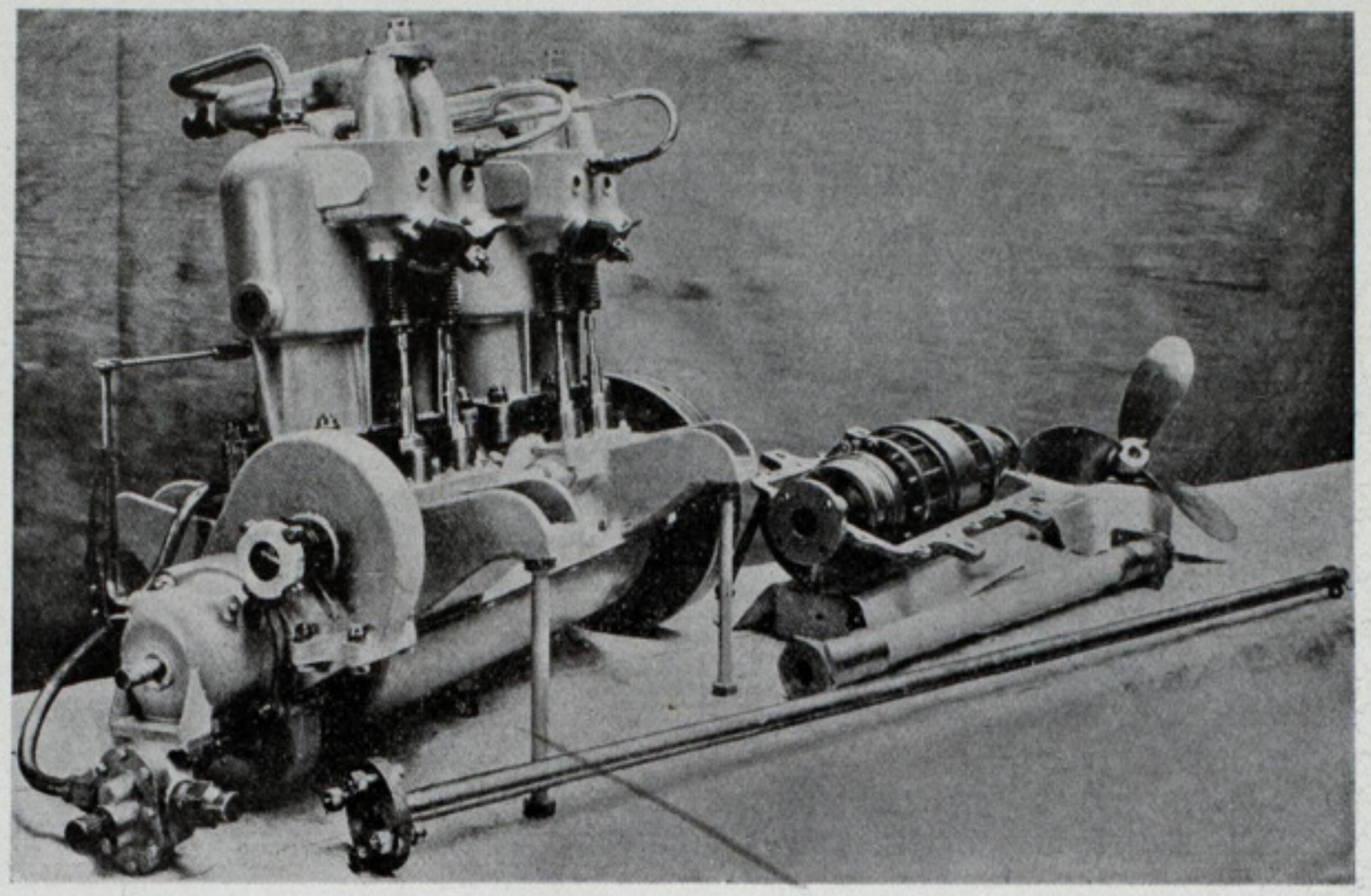


FIG. 4. 20 B. H. P. PETROLEUM MOTOR WITH REVERSING CLUTCH.

charge on compression, but it is only possible to work with a very low compression, to avoid premature ignition, and therefore the type of engine is necessarily a heavy one.

The Diesel engine, which has as yet been only used in one or two cases for marine purposes, is a most interesting type. It works on the four - stroke cycle, but sprays the oil into the cylinder by means of compressed air at the end of the stroke, the compression being so high (viz., about 500 lb.) that when the oil is sprayed it at once ignites, owing to the heat of the compression, which is about 1,000 deg. F. There is no actual explosion, as the fuel is introduced into an excess of air, and burns as it is injected. A gradual and complete combustion of the fuel takes place, resulting in a very high economy. The power can be regulated to a very great nicety, as the fuel is always burned at the same temperature, but in varying quantities. The engine is, however, necessarily a heavy one to withstand this very high pressure, and the lightest type so far gives only about 10 H. P. per ton.

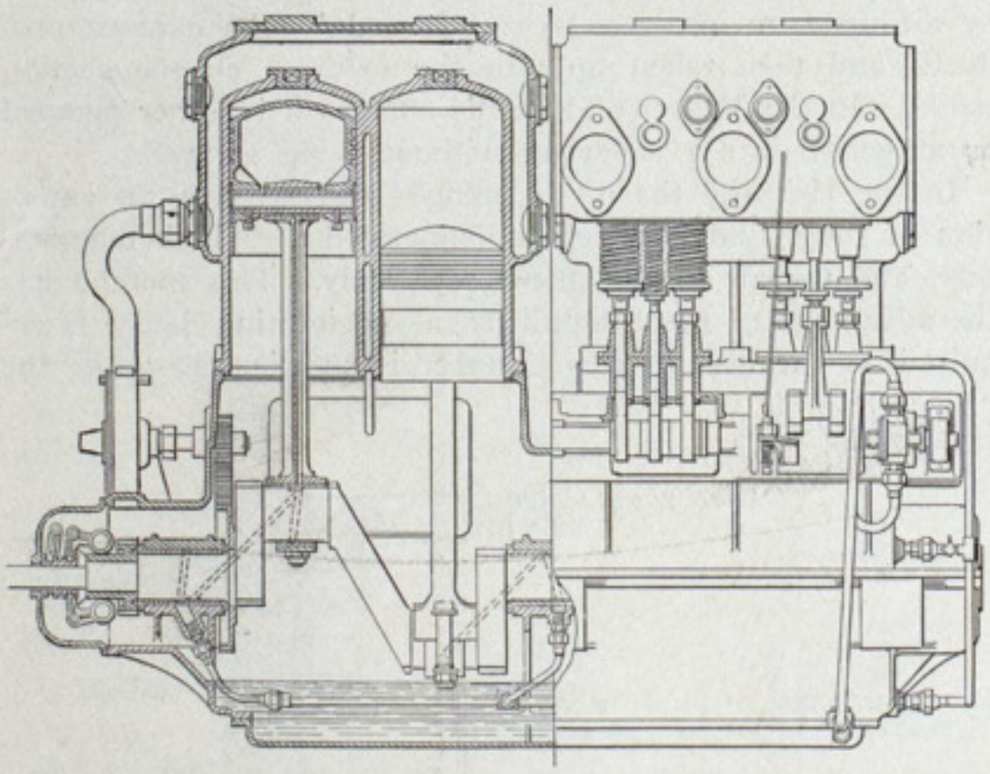
The Strickland engine is designed on the same principle of injecting the fuel at the end of the compression stroke, but does not compress to more than 200 lb., and, therefore, has to use an igniting device. It is also arranged to work as a two-cycle engine, giving an impulse at every revolution, as some of the Diesel engines have done. It is fitted with a prolongation of the piston to form a pump to supply the air for the scavenging stroke, and the necessary air for combustion.



20 B. H. P. THORNYCROFT MARINE OIL MOTOR.

It would seem that an engine of this type, not working at too high a compression, so that it does not require to be so very strongly built, and giving two impulses for one of engines working on the Otto cycle, should have very great advantages, as a high mean pressure can be obtained without danger of premature ignition, and no vaporizers are required for the fuel, the vaporizers being always the part of the engine most difficult to design, and requiring the largest amount of attention.

Engines of the second type will always be more difficult to handle in consequence of the vaporizing difficulties than the first and third, but it is probable that because of the portability, safety and comparative cheapness of the fuel they will be used very extensively.



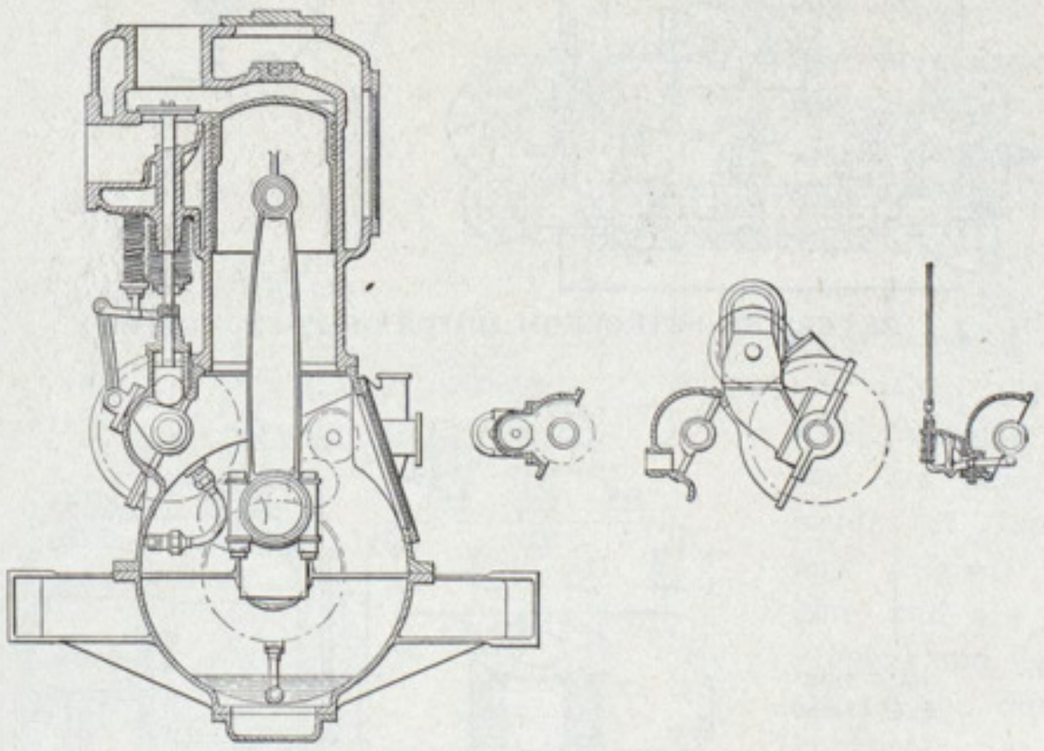


FIG. 5—100 B. H. P. THORNYCROFT FOUR-CYLINDER 8 BY 8 OIL ENGINE.

Engines of the third type.—The gas engine has hardly yet been tried for marine purposes, but owing to the recent great improvements in gas producers it is thought that they will soon be used very extensively. An engine designed for working with gas from solid fuel consists essentially of the same parts as engines of the first and second classes without the apparatus for vaporizing the oil or spirit, the gas producer taking the place of the vaporizer, but being necessarily much more cumbersome. But the gaseous fuel which is produced is essentially different to that produced by the vaporizer or carburettor of engines of the first two classes, as

MARINE REVIEW

it is a stable gas, and can be stored if desired, and the vapor cannot, so that when the maneuvering is taking place, and the engine is being stopped and started, the producer is not entirely put out of action, as is the vaporizer, but to some extent can act as a fly-wheel and reserve of power, like a steam boiler.

The recent improvements, which have enabled the producer to be worked without the reservoir for the gas, the engine sucking the supply directly from the producer, makes the apparatus much less bulky, and therefore better adapted for marine purposes. The first type of engine is necessarily the lightest, as there is no vaporizer or producer, the fuel being vaporized by the simple expedient of sucking the right amount of fuel in with the air to the cylinder. Engines of this class are being made to weigh not more than 10 lb. or 12 lb. per broad horse power. Comparing this figure

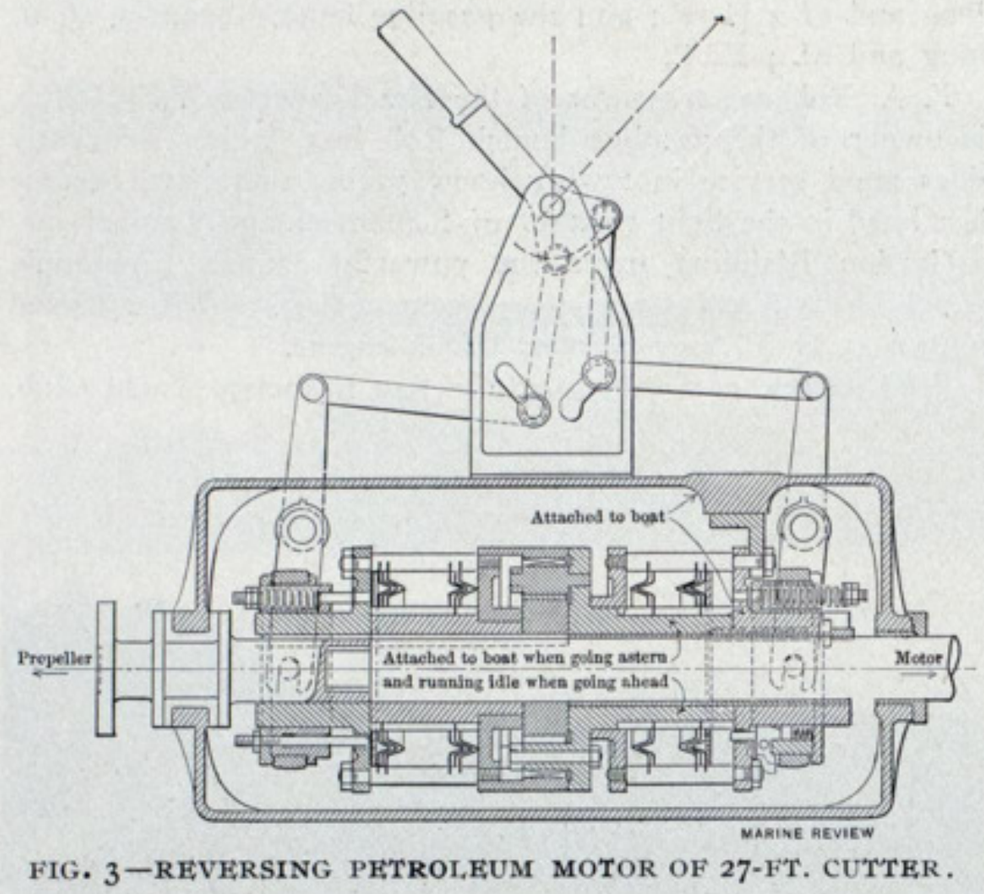


FIG. 3—REVERSING PETROLEUM MOTOR OF 27-FT. CUTTER.

with that of the modern torpedo boats or destroyers, which is 50 lb. per indicated horse power, it is evident that the naval architect has great possibilities with this type of engine. There is every prospect that engines of the second class will be built, including the vaporizer, for not more than 25 lb. per broad horse power for moderate sizes. The engine of the third class should not be heavier, but, of course, there must be added the weight of the producer.

Starting and Reversing.—The smaller types of engines for launches are very easily handled, it being possible to start them up by a few turns of the engine; but, when the size gets too great to be man-handled, other means of starting have to be devised. In the large engines used in the submarines, the engine is used in conjunction with the electromotors and dynamos, so that the motor can be used for starting up the engine.

In the case of the first and third classes, the starting is not very difficult as the engine can be turned very slowly with a suitable turning gear, and then, the cylinder being full of an explosive charge, they can be fired electrically at the right time, and the impulse is sufficient to carry the engine round for several revolutions and set it in operation.

In case of the second class this is not practical, and it is necessary to have a reservoir of compressed air or gas of sufficient volume to give the engine several turns working as a pressure engine; this, of course, necessitates additional valves for the purpose. In smaller motors it is possible to reverse either by a reversing screw, or, in some instances, it is accomplished by stopping the engine, and by having suitable cams for operating the valves and starting the engine in the reverse direction by hand, but this has not been found very satisfactory, and the best practice seems to be to fit the engine with a suitable reversing gear and clutches for throwing it in and out of gear. It is, at present, unknown to what sizes these reversing gears can be successfully built, but recent improvements in clutches made by Prof. Hele Shaw go to show that there should be no great mechanical difficulties in producing them up to several thousand horse power.

The Bertheau engine has been especially designed with a view to making it very easily handled. Reservoirs are provided into which the engine compresses or delivers the burnt products of combustion at a high pressure; the compressed gases in this reservoir being used when required for starting up the engine, or giving it a few impulses in a reverse direction when it is required to go astern. The engine is provided with a double set of cams, either of which can be thrown into operation, and at the same time the engine is converted from a four cycle to a two cycle, to better enable it to maintain its speed when it is being driven by the compressed gases as a pressure engine. The author's firm are building engines of this type of considerable power, and he thinks that probably, although the engine is complicated by these appliances, it will be found better in the larger sizes than any reversing gearing.

A comparison of the weights and space occupied by comparatively low-powered engines of the first class fitted to launches in the place of steam engines and boilers of the same power shows very greatly in their favor; but when petrol is used as fuel it will be found more expensive than coal to do the same work. On the other hand, as the engines are practically automatic in action, and can be started at once (requiring no preparation like a steam boiler), an engine driver can be usually dispensed with, and, as the steersman can do all the work of controlling the vessel, it will frequently be found cheaper to run with this class of engine than with steam.

While there is very little danger from fire with properly constructed engines, fitted with electrical ignition, and using spirit or oil of a low flash-point in open boats, the risk must not be disregarded where they are fitted in a closed engine room below decks.

Capt. du Boulay has devised an arrangement by which only a small quantity of fuel is kept in the engine room in a small tank, any leakage draining directly overboard. The main supply is stored in a tank in a specially bulkheaded compartment, which also drains overboard; and in some cases the sea is allowed to flow into it and around the tank, thereby avoiding any possibility of the leakage of oil into the bilge of the vessel.

With engines of the second class, using oils having a flash-point of above 75° F., there is practically no danger from fire, and when the engine will work with less than 1 lb. of oil per horse power hour, the cost of working will, as a rule, be found less than that with the equivalent steam machinery; but as yet there has always been the disadvantage of an objectional exhaust.

The Diesel engine costs only one-tenth of a penny per hour, as it works with unrefined oils, which can be bought for 2d. per gallon, and uses less than ½ lb. of oil per horse power hour. Only the most economical steam engines, supplied with coal at not more than 10s. per ton, can equal this performance.

It is well known that gas engines of even small powers, supplied with producer gas, give considerably more power per lb. of fuel than could be obtained with a steam engine and boiler, and when large plants are used, a given quantity of fuel will produce about four times the power obtainable with ordinary steam engines.

Gas producers must be divided into two classes—those which work with non-bituminous coal and those which work with bituminous. The former class working as a suction producer is very simple, and weighs, as made for land purposes, considerably less than the ordinary type of steam boiler to do the same work, but, owing to its being restricted to

one class of fuel, its use must be very limited for marine purposes.

The producer invented by Dr. Mond for using bituminous fuel has not been worked out suitably for marine purposes, and as used on land is heavier than boilers of the same power; but it seems probable that, owing to the much greater economy obtained and the rapid development which is going on, it will soon be possible to employ producers of this type.

Fig. 1 shows the space occupied in a 27-ft. navy cutter by a reversing engine of the second class, replacing the standard pattern steam engine and boiler, which take just twice the length of a boat.

Fig. 2 shows the relative space occupied by the machinery of a torpedo-boat destroyer, fitted with the usual machinery, and an engine of the second class working on the Otto cycle, at the same piston speed as the steam engine.

Fig 3.—Reversing motor (Bertheau's patent).

Fig. 4.—20 H. P. petrol engine.

Fig. 5.—100 H P. oil engine.

Fig. 6—Reversing clutch.

LAUNCH ACTIVITY IN SAN FRANCISCO.

Nearly all the gasoline launches and automobile boats that are used for pleasure on the Bay of San Francisco are enrolled in one or other of the yacht clubs. These are the San Francisco Yacht Club, organized in 1873; the Corinthian Yacht Club, organized in 1886; the Encinal Yacht Club, organized in 1892; the California Yacht Club, organized in 1893; the South Bay Yacht Club; the Vallejo Yachting & Boating Club, and the Oakland Canoe Club.

The house and anchorage of the San Francisco Yacht Club are at New Sausalito, Marin county. The Pacific Yacht Club, an offshoot from the San Francisco Yacht Club, with a handsome club-house at Old Sausalito, is now extinct. Nearly a score of power boats are at present on the roll of the San Francisco Yacht Club. The largest and most powerful of these is C. F. Kohl's gasoline launch Idlewild, which is 60 ft. long and of 95 H. P. She has a 4-cylinder "Union" engine and on her trial trip developed 105 H. P. F. A. Hyde, president of the Automobile Club of California, owns the launch Olive (at first named Vladimir), the hull of which was built by John Twigg, Sons & Co., the well-known San Francisco boat builders, and which is equipped with a 4-cylinder Union marine engine made by the Union Gas Engine Co. of San Francisco. The engine is rated at 35 H. P., but works up to 52 H. P. The Olive is 47 ft. long.

George W. Baxter, formerly governor of Wyoming, has a steam launch, 60 ft. long, named Green Dragon. James Kitterman, formerly port captain of the San Francisco Yacht Club, owns the gasoline launch America, which is 50 ft. long and of 50 H. P.

George A. Knight, a well-known criminal lawyer of San Francisco, owns the fast gasoline launch Athlete, 35 ft. long and of 20 H. P.

L. C. Pistolesi owns the gasoline launch Bear Flag, 17 ft. long and of 2 H. P.; and the gasoline launch Sequoia, 26 ft. long and of 4 H. P.

F. A. Robbins, treasurer of the San Francisco Yacht Club, is owner of the gasoline launch Rob Roy, which frequently does good service in towing home yachts that have become becalmed in the light weather of September and October.

Gordon Blanding owns the powerful launch Chipmunk, which has a length of 55 ft., a beam of 8 ft. and is equipped with a 45 H. P. four-cylinder Union engine.

Fred Raisch, port captain of the San Francisco Yacht Club,

LAUNCH DOT, OWNED BY W F. JEWETT, GARDINER, ORE. LENGTH 23 FT , 6 H. P STANDARD ENGINE, SPEED 10 MILES.

owns the handsome naphtha launch Edwinna, 35 ft. long over all and of 16 H. P.

Dan Miller's Kittie M. is a gasoline launch, 26 ft. long, and of 10 H. P.

C. R. Barney's launch Petrel has a length of 24 ft. and is equipped with a Standard gas engine of 5 H. P.

J. Gilmaker's pleasure boat Hulda has a length of 23 ft., and is equipped with a Standard gas engine of 6 H. P.

St. Francis is a gasoline schooner 44 ft. over all.

E. W. Hopkins owns the only steam yacht on the waters of San Francisco bay. She is named El Primero, is 120 ft. long and has engines of 250 H. P.

At Tiburon, Marin county, are the club house and anchorage of the Corinthian Yacht Club. Many pleasure launches are owned in Tiburon and the adjacent town of Belvedere. Charles Crocker's launch Wanderer is equipped with a Corliss engine of 12 H. P. T. Jennings, commodore of the Corinthian Yacht Club, owns a launch equipped with a 10-H. P. Union gas engine. This craft is much in evidence when the work of towing the Corinthian yachts into winter quarters in the lagoon behind Tiburon at the end of the season, or

LAUNCH GAZELLE. 16 H P., OWNED BY GEORGE FORREST OF SAUSALITO BAY, SAN FRANCISCO.

of pulling them out into Tiburon cove at the beginning of the season, is on hand.

W. B. Wallach, assistant treasurer of the Pacific Mail Steamship Co., is owner of the launch Allegro, which has a California gas engine of 15 H. P.

Percy Burr's little launch Cub has a 3-H. P. Standard gas engine.

Sidney L. Plant's launch Chiquita is equipped with a 3-H. P. Corliss engine. F. Bridge owns a pleasure boat in which is fitted a 4-H. P. Hercules engine. Mr. Bernard has a boat equipped with an engine of like power. Another launch bearing the name Chiquita was brought to San Francisco from Philadelphia.

STANDARD, EXHIBITED IN NEW ZEALAND AND AUSTRALIA.

J. Elliott has a covered launch equipped with a Cinch engine built in Detroit. Her owner brought the craft down from Lake Tahoe to San Francisco bay and may take her to Santa Catalina island during the summer.

The launch Rusty, equipped with a 16-H. P. Union gas engine, is owned by P. H. Brooks.

F. W. Kelley, manager of The Breeder and Sportsman, owns two power boats. A new boat, not yet launched, has been built by Swanson for Frank Bowers; it will be equipped with a 15 H. P. engine from Buffalo, N. Y.

The yawl yacht Naiad is fitted with a gasoline engine and is generally used as a power boat, seldom hoisting her canvas.

The power boat Victor, 45 ft. long, is being outfitted in Oakland creek for her owner, J. Wight.

D. Ostrander of San Francisco has just had built for him, after his own plans, the power-boat Elmo, 22 ft. long with a beam of 6 ft. 3 in. She is constructed of eastern cedar, ironwood and teak. Her engine is of 6 H. P. and has an 18-in. bronze propeller. On her trial she behaved well in a strong wind and heavy sea and is expected to develop high speed when tuned up.

At Stockton, on the San Joaquin river, a tributary of San Francisco bay, the power boat Lucille is equipped with an engine like that on F. A. Hyde's launch Olive.

On San Antonio estuary (or Oakland creek, as it is commonly named) are the headquarters of the California Yacht Club. Here Eugene Flanders owns the launch Alert and Alexander Hay the launch Aloha.

The house and anchorage of the South Bay Yacht Club are at Alviso, which is a few miles distant from San Jose, where most of the members of the club live. The fleet includes the pleasure launches Frank D, owned by Frank Davis, the launch A. & C., owned by Coykendall & Sons, and the launch Alviso, owned by Oliver Ortley.

The most powerful and most costly gasoline boat ever owned on the Bay of San Francisco belonged to the late Charles L. Fair, who was killed in an automobile accident near Paris, his wife losing her life at the same time. She was named Lucero and was built on Puget sound by R. T. Engelbrecht. Her gas engine was made in San Francisco and sent up to Seattle. She was 100 ft. long, with a beam of 16 ft. 6 in. and a depth of 7 ft. She had a four-cylinder gas engine and could develop 110 H. P. On the way down to San Francisco from Seattle she put into Port Blakeley on account of foggy weather and into Astoria because the bearings of the engine were out of order. On the journey from Astoria to San Francisco she used 200 gallons of gasoline in twenty-four hours. She contained three large staterooms, a bathroom, a galley and was very handsomely fitted. She was never considered a successful craft and was little used by her rich owner. Two years ago she was sold to the Pacific Packing Co., and, after being fitted with steam engines, was sent to Seattle, to be used as a dispatch boat between that port and the salmon canneries owned by the company in Alaska.

The Italian fishermen of San Francisco bay use boats, nearly all of which are equipped with 3 to 20-H. P. marine vertical engines built by Adam Schilling & Sons of San Francisco, The engines are named Golden Gate and are simple, durable and steady running. The valves are in the cylinder

W. A. BOOLE & SON'S LAUNCH NO. 1.

head, so that all the mixture that passes is in the cylinder ready for explosion. The charges are regulated by a governor attached to a cam and the inlet valves.

The boatmen of San Francisco bay employ many gasoline launches for conveying pleasure parties and keeping up communication with the men-of-war and merchant vessels in the harbor. Henry Petersen owns a fleet of six launches, all equipped with Union engines. Thomas Crowley & Bros. also have a fleet of six launches, all fitted with Union engines. The C. A. McNeill Launch Co. owns a fine boat, 50 ft. long, with 11 ft. beam, fitted with a four-cylinder Union engine of 85 H. P. She is named Flyer.

The Union Gas Engine Co. has been building gasoline engines since 1885 and has sent its products not only to all parts of the United States, but to Alaska, British Columbia, eastern Canada, Mexico, Central and South America, Cuba, the Hawaiian islands, Tahiti, Samoa, the Fiji and Philippine islands, Australia, New Zealand, China, Japan, Siberia, Manchuria and other countries. The Union gas engine is of the four-cycle type, with one, two, three or four cylinders, according to its size and power. The marine type is governed by the automatic or throttling method which graduates the charge according to the horsepower exerted, the charge being regulated by the governor. The consumption of liquid in small engines is one-eighth of a gallon per horsepower per hour and one-tenth of a gallon per horsepower per hour in the larger engines. Gasoline, naphtha, benzine or distillate may be used. For using kerosene or crude petroleum special

CRUISING STEAM LAUNCH DECKED ALL OVER. DIMENSIONS 42 FT. BY 8 FT. BY 4 FT.
FITTED WITH COMPOUND ENGINES 6 AND 12 BY 9 IN.

fittings are made. The parts of the Union engine are few and are put as much as possible on the outside; the engine is wholly automatic in operation. No flame or hot tube is used in starting or operating, and the gasoline and air can be mixed in the engine only. As most accidents on launches are caused by defective tanks or pipes, the Union tank is specially constructed of heavy copper and fully tested with air pressure. The igniters are of the hammer type and are operated without springs inside the engine. The charge is ignited by an electric spark, the dangers from hot tube or open flame ignition being thus avoided. The governor is centrifugal in type and is operated by a gear on the cam shaft. On engines of 6 H. P. or more it is directly under the influence of a controller. Thus the speed of the governor can be at once changed, the engine being still left under its control. No gears are used between the engine and propeller when going ahead; when going astern bevel gears are brought into play.

Union engines of 5 H. P. and 8 H. P. are made for supplying power to a ship's hoist and windless.

Many launches used for pleasure or commercial purposes on the Bay of San Francisco and adjacent waters are equipped with Standard gas engines manufactured by the Standard Gas Engine Co. of San Francisco. James H. Budd, formerly governor of the state of California, has for several years owned and operated, for pleasure, gasoline motor launches. He owns a launch equipped with a 5 H. P. Standard engine and considers the motor an excellent one.

The American Dredging Co. of San Francisco owns the launch Yankee, which is fitted with a three-cylinder 50-H. P. Standard gas engine.

The Sacramento River Packing Association of Black Diamond, Cal., has a 4-H. P. Standard engine in a motor boat, which has traveled nearly 1,400 miles in a single month.

J. P. Chamberlain, of the Mira Monte Gun Club at Burdell, Cal., owns the launch Mira Monte, 26 ft. long, equipped with a 12-H. P. Standard engine.

Charles Peterson, a boatman with headquarters at Folsom street wharf, San Francisco, owns the launch Barbara, 32 ft. long, 8 ft. 6 in. beam, 30 in. draught, equipped with a 16-H. P. Standard engine.

W. A. Boole & Sons, the Oakland creek ship builders, own a craft named Launch No. 1, 50 ft. long, with 12 ft. beam, 5 ft. depth, enquipped with a 50-H. P. Standard engine. She has a speed of 12 knots.

The Franks Reclamation Co. owns the launch Tule Queen, which is equipped with a 20-H. P. Standard engine. It is operated on the San Joaquin river.

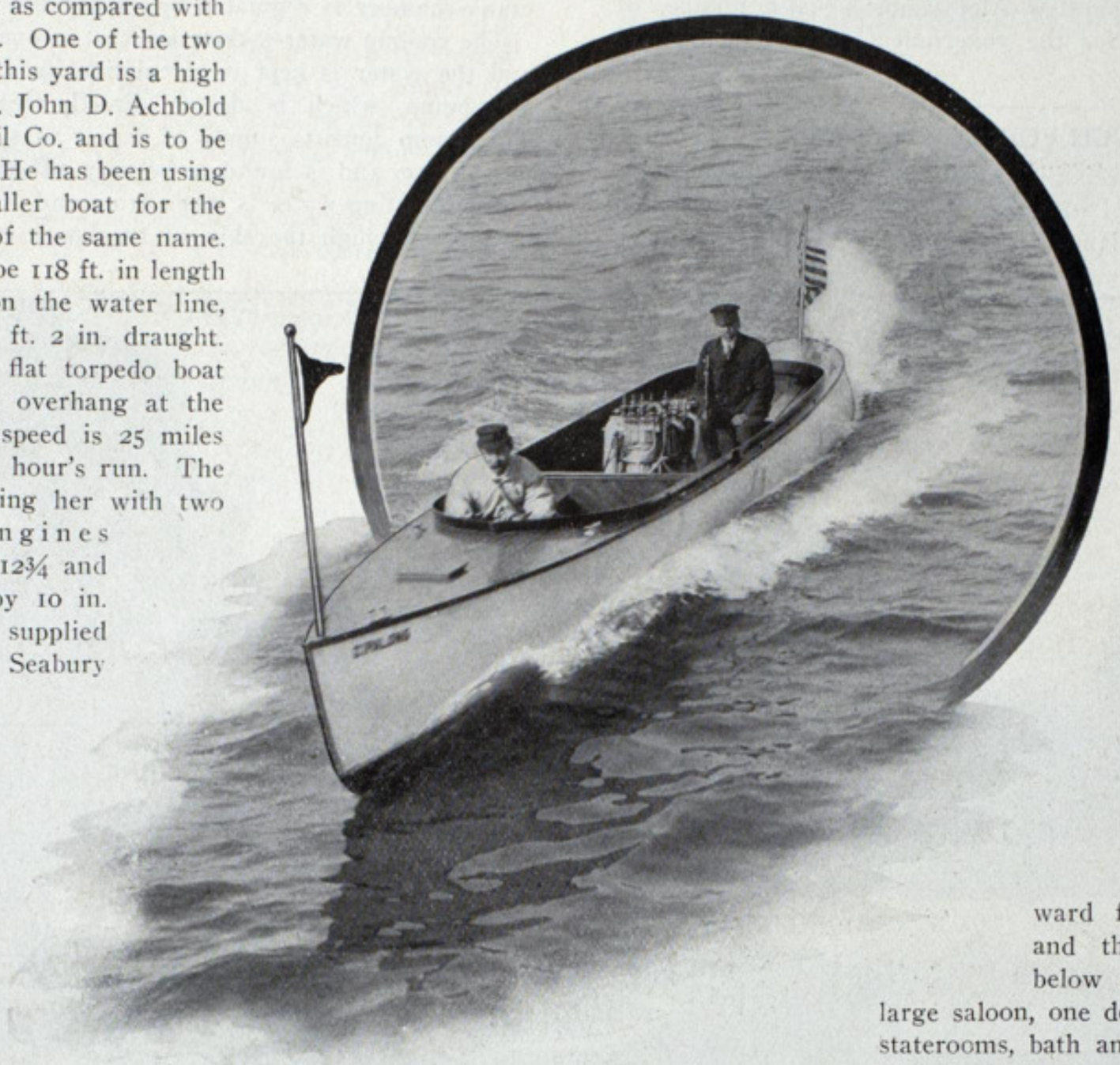
Gateley Bros., boatmen at the Vallejo street wharf, San Francisco, are the owners of the launch Amelia, in which is an 8-H. P. Standard gas engine.

George Peres, boatman at Tiburon, Marin county, Cal., has a Standard engine in his launch Leonie, and George Forrest, a boatman at Sausalito, in the same county, owns the launch Gazelle, which is fitted with a 16-H. P. Standard marine engine.

The San Francisco Yacht Club, the oldest on the bay of that name, intends to hold a regatta for motor boats and launches on Sunday, Oct. 9. At that time of the year the strong winds that prevail during the summer have died down, and the water is calm throughout the day.

BUILDING TWO HIGH CLASS STEAM YACHTS.

The Gas Engine & Power Co., and Charles L. Seabury & Co., Consolidated, Morris Heights, New York, have only two steam yachts of fair size under way. Work of this character at all yards is slack as compared with the average season. One of the two yachts building at this yard is a high speed craft for Mr. John D. Achbold of the Standard Oil Co. and is to be named the Vixen. He has been using a similar but smaller boat for the past two seasons of the same name. His new boat will be 118 ft. in length over all, 114 ft. on the water line, 12 ft. beam and 4 ft. 2 in. draught. The model has a flat torpedo boat stern and a slight overhang at the bow. Guaranteed speed is 25 miles an hour for a full hour's run. The company is equipping her with two triple-expansion engines with cylinders 8, 12¾ and 20 in. diameter by 10 in. stroke of piston, supplied with steam from a Seabury water-tube boiler. She will be more comfortable than the average high speed steam yacht of this class, the owner having a large deck house forward to include the dining room, a bridge over the deck house and below the deck a large stateroom, the full beam of the ship, with saloon, toilet and locker accommodations. Over the machinery and owners' quarters she will have a trunk house of steel. The hull construction is made up of oak frames with steel floor angles, steel sheer and deck streaks, double yellow pine planking with copper fastenings, about 1,200 fastenings to each streak. She has the distinctive feature of two stacks. Mr. Archbold will use her for daily service between his home in Tarrytown and New York city. The first Vixen was 100 ft. in length of the same general style and during the past season her log book shows over 14,000 miles running with 1,200 landings during which time she was not once disabled from breakage of machinery. The second yacht building is the Machigonne for Mr. Cyrus Curtis of the Curtis Publishing Co., Philadelphia. She is designed as a cruiser with good stability for rough water use and is 115 ft. long, 16 ft. 6 in. beam and 7 ft. 6 in. draught. The model will be the regulation clipper bow and overhanging stern. Her construction is of a rigid and durable character to make her a comfortable and safe craft. She will be equipped with a single triple-expansion engine 8¼, 14 and 23 in. cylinder diameter by 12 in. stroke of piston and will have a guaranteed speed of 14 miles per hour. She will have a mahogany deck house forward for dining purposes, and the owner's quarters below deck will be aft, a large saloon, one double and two single staterooms, bath and other accommodations.



ZIPALONG.

[Built by Gas Engine & Power Co., and Charles L. Seabury & Co., Consolidated Morris Heights, N. Y.

In smaller craft the company is building a steam launch of 50-ft. waterline for general service by the dock department of New York city; a 35-ft. knockabout to be used for racing by a party whose name cannot be given at this time; a 67-ft. gasoline boat with guaranteed speed of 30 miles per hour; four 45-ft. boats all to be equipped with the company's six-cylinder Speedway gasoline motor and built on the torpedo boat model, two of them to have 5 ft. beam with guaranteed speed of 21 miles per hour, one to have 6 ft. beam with speed of 20 miles and the fourth to have 6 ft. beam and cabin forward with speed of 18 miles per hour. Of the same class the company is building two 40-footers of 20 miles' speed, to be equipped with four-cylinder Speedway motors

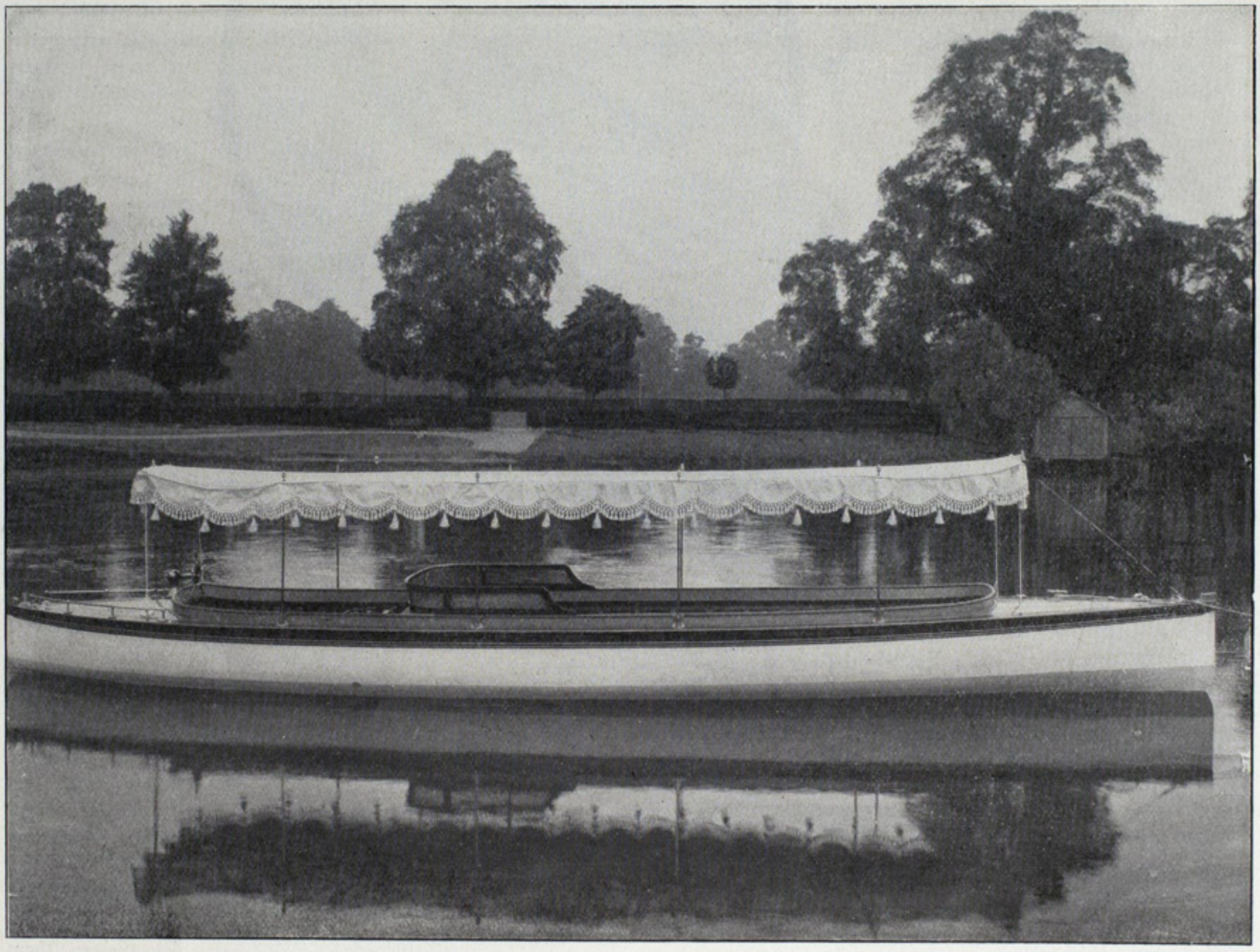
AUTOMOBILE BOAT G. WHIZ.

and two or three of smaller size with speed from 12 to 16 miles.

In addition the company has on hand the usual large number of gasoline and naphtha launches in size from 16 to 50 ft., and are also building a few Alco vapor boats, a number of which will be used for the government torpedo boats and destroyers as tenders.

LAUNCH FOR EDWARD VII.

On the present page is illustrated a new petrol launch built for King Edward VII of England, by Messrs. Tagg & Son, East Moulsey. The launch is propelled by an internal combustion petrol engine designed by the Thornycroft Steam Wagon Co., Chiswick, and constructed by Messrs. J. I. Thornycroft & Co. of Chiswick. The skin of the boat which is of teak and cedar is of treble planking, the outer planks running parallel to the waterline, the inner ones diagonally and the outer ones transversely to the boat. The over all dimensions of the boat are: length, 32 ft.; beam, 6 ft.; draught, 2 ft. 9 in. The engine is similar to that fitted to large motor cars. It will develop 20 B. H. P. when running at the normal speed of 900 revolutions per minute. There are four cylinders, each 4 in. in diameter by 4 3/8 in. stroke. They are bolted to one illuminium bed plate. The engine bearers are cast in one with a top half of the crack chamber or bed plate, so that the bottom can be removed without disturbing the engine. The keeps to the crank shaft bearings are not formed in the bottom half of the crank chamber in the usual way, but are quite separate, so that on removing the bottom half the crank shaft is left in position.



LAUNCH BUILT FOR KING EDWARD VII, OF ENGLAND.

The half-speed gear for driving the cam which works the valves, and also the governor, is enclosed in aluminium castings formed in one with the crank-chamber. Lubrication is on the splash principle, and the correct amount of oil in the crank-chamber is regulated by an overflow pipe.

The cooling water-jackets are cast in one with the cylinders, and the water is kept in circulation by what is known as a gear-pump, which is driven directly from the crankshaft. This pump consists simply of a pair of spur-wheels enclosed in a casing, and is found to be very effective for the purpose. The circulating water is taken from and discharged overboard by pipes through the skin of the boat, so that an abundant supply of cold water is obtained.

The engine inlet valves are of the automatic type, and governing is effected by throttling the combustible mixture. The handle for starting the engine on first going off is connected to the crankshaft by a chain and ratchet wheel. The two forward exhaust-valves have an attachment by which they may be kept open until the engine has got to work, thus relieving the compression on these two cylinders and making starting easier.

A Stethnos carburettor is adopted, petrol being supplied to it from a small tank; holding one gallon, situated near the engine. The main petrol supply tank is right forward, and has a capacity of 16 gallons; the two tanks are connected by a copper pipe enclosed in a lead pipe, so as to minimize the chance of leakage. The petrol is pumped by hand from the large to the small tank. The latter stands in a metal tray, which is drained overboard by a pipe, so that any leakage which might occur would be instantly conveyed away; the

carburettor also stands over a tray. It has been found that the heat given off from the exhaust-pipes, although they are lagged with asbestos, is unpleasant to those sitting in the stern of the boat. It has therefore been decided to water-jacket the exhaust, and the cooling of the gases which results also make the exhaust more silent.

The speed of the boat, with the engine running at normal revolutions—that is, about 900 revolutions per minute—is about 10 miles per hour; but the engine may be accelerated up to 1300 revolutions, which will give a speed of about 13 miles per hour. The ignition is on the high-tension principle, current being supplied from two secondary batteries. De Dion pattern sparking-plugs are used. External spark-pumps are fitted, and these being always in view, the driver can tell at a glance whether the sparking mechanism is in working order.

It has already been stated that the tank capacity of this boat is 17 gallons, and it has been found by careful experiment that the engine consumes one pound of petrol per brake horse-power hour. Therefore, when traveling at the rate of 10 miles per hour, the engine developing 20 H. P., 20 lb. (approximately 2½ gallons) of petrol will be consumed at the end of 10 miles—that is to say, the tanks are of sufficient capacity to carry the boat somewhat over 60 miles. It may here be interesting to compare the weight of a steam-engine and boiler of equal power with this engine. The weight of the petrol-engine complete, with reversing gear, batteries, etc., and petrol sufficient to take the boat 60 miles, is very nearly 500 lbs. A 20 B. H. P. double-acting condensing steam-engine and boiler complete would weigh about two tons, and coal and water sufficient to last for 60 miles would amount to about one ton, 300 lbs., making a total of three tons, 200 lbs., or twelve times the weight of the petrol engine and fuel.

The petrol-engine also compares favorably with the steam machinery in regard to space. Even if the petrol-engine occupies a little more room than a steam engine, the greater part of the propelling mechanism—the boiler—is left out. The gain in weight and space is, therefore, considerable, and allows of greater comfort or a much larger number of passengers being carried.

THORNYCROFT RACING BOAT SCOLOPENDRA.

The Scolopendra, as the Thornycroft racing boat built by Messrs. J. I. Thornycroft & Co., Chiswick, has been named, is 30 ft. long, 5 ft. beam and has an extreme depth of 2 ft. 1 in. She is plain carvel built of varnished cedar with American elm timbers. There is a turtle deck forward and a light pine deck aft, covered with union silk and painted. One of the most noticeable features about the boat is her stern, which is flattened under water like a Thornycroft torpedo boat, and has the forward rake above water, peculiar to this

LAUNCH FOR HARBORS. LENGTH 40 FT., BREADTH 8 FT. 3 IN., DEPTH 3 FT. 9 IN.

[Built by Tolch & Co., Fulham, London.

FAST WATER LAUNCH WITH TURTLE DECK. LENGTH 25 FT., BEAM 6 FT. 6 IN., DEPTH 3 FT. 3 IN.

[Built by Tolch & Co., Fulham, London.

firm's torpedo boats. It gives her a very smart appearance and to a great extent prevents settling by the stern when going fast. The illustration of the Scolopendra is used as the headpiece of Mr. Thornycroft's article upon "Gas and Oil Engines for Marine Propulsion," published in this issue. It will be seen that she makes very little wake even when going at full speed, which is about 18 knots. The engine is a counterpart of the 20-B. H. P. motor fitted by the Thornycroft Steam Wagon Co. to the larger motor cars and is similar to

PASSENGER BOAT FOR SEA WORK. LENGTH 36 FT., BREADTH 8 FT., DEPTH 3 FT. 6 IN.

[Built by Tolch & Co., Fulham, London.

that installed in the launch built by Messrs. Tagg & Son for King Edward VII. A picture of this latter vessel, together with a description of her engines, is also given in this issue. The engines of the Scolopendra and the launch for King Edward will be found illustrated in Mr. Thornycroft's article in this issue.

An interesting ocean race has just been concluded between the Glasgow four-masted barque Loch Carron (2,075 tons) and the French ship Jules Gommes (1,901 tons) from San Francisco to Queenstown. Both ships did the voyage in 112 days. They were in company for five days sailing neck and neck. They subsequently separated, and saw nothing of each other until the 18th of March, when, in the North Atlantic, they again came in company and exchanged friendly signals, afterwards losing sight of each other. The French ship arrived about 1 p. m., while the Glasgow ship arrived at 7 a. m. next day.

LAUNCH SITUATION IN BUFFALO.

Buffalo, May 3.—Everybody who has looked the situation over pronounces this city especially adapted to the use of power yachts and for more than one reason. The Niagara river is a very attractive waterway and boats go down to Grand island and further with the greatest ease, but the return is another story. With a stiff current practically all the way and sometimes running up to 10 miles an hour it is out of the question to do anything with sails alone, so that the yacht fleet is obliged to get up on lake level as soon as possible and stick to it.

There is a great increase of attention paid to yachting of late and all the clubs in that line have added to their membership and general importance very materially, where they were struggling along in a much smaller way in former years. Expensive sail yachts are coming into the organization right along of late. This means that there are sure to be plenty of the more wealthy of the younger men who would be glad of something that could be used anywhere within 20 miles of the city in ordinary weather and on the Niagara any time when the ice was out of the way.

CHANTICLEER OWNED BY GEORGE W. WELD, BOSTON, MASS.

Still some inquiry into the case among gas engine people, who are expected to solve the problem if anyone does, finds them for the most part disinclined to take it up at all at present, unless it be to keep abreast of the movement and enter the race for business as soon as there seems to be anything tangible to it. Of course there is nothing more to be expected of steam. It has done what it could and is not satisfactory to the yachtsman. He wants a motor that will not need a skilled engineer to handle it, and he wants something that will do for him on the water what the gasoline automobile is doing for him on land.

At least some of the leading automobile builders here are convinced that this can never be done. The man of leisure on pleasure bent is asking too much. He wants a boat that can be driven through the water at a 30-mile rate or something of the sort, and some builders on the coast and abroad are trying to furnish it. One or two Buffalo automobile factories have turned out a boat or two but so far as learned they are mere experiments and are not likely to be made the beginning of a regular business.

A leading Buffalo automobile builder said that he was convinced that the boat demanded was a freak and the desire for it would turn out to be a fad and he had made up his mind, after studying the matter with the idea of going into the business if it promised anything, that there was not much use of making the effort till the fad had subsided. The gasoline motor that is now in use is, according to his researches, quite often a matter of 6 H. P. It weighs from 400 to 500 lbs., and will drive a boat about eight miles an hour. Of course such speed as that is by no means fast enough for this age. Even twice that rate is rejected.

What the automobilist thinks can be done now is to evolve a gasoline engine that might not weigh more than 400 lbs., but could be made to develop 24 H. P. and propel a boat 16 miles an hour. He is of the opinion that the demand for anything faster than that now is out of the question, and as he knows that such a boat is not fast enough for the racing automobilist he has concluded to wait awhile and see how the matter turns.

The main difficulty is that in order to develop a reasonable amount of speed the boat's propeller must make something like 1,600 turns a minute, and this is open to two great objections. The motion of the wheel at such a rate always gives the boat a bad list and then the spray, especially in salt water, is something terrible, and so far there does not seem to be any very good way of getting out of the way of it. Goggles will not answer, for the spray soon blurs them up so that nothing can be seen through them. A New York expert writes on this point that he thinks the 50-H. P., 30 or 35-ft. launches will drown out its passengers, while a 25 horsepower in a launch of this length, with good speed, is all the public would stand for.

For all this it appears that the coast is going to make the experiment and it also appears that Buffalo is about agreed to wait till some result is reached, while it is not denied that the public here as well as eastward, is anxious to take a long step towards a motor boat that will make racing and general pleasure-going on the water what the automobile has accomplished on land. While it does not appear that the gasoline engine builders here are discouraged they see no chance of meeting the demand on them and will wait till it is modified quite materially.

JOHN CHAMBERLIN.

The placing of so many ship building orders lately has caused trade in Great Britain to look with some misgivings on the future course of the freight market. Reports from usually well informed quarters give the number of orders placed on the East Coast alone at eighty steamers, in addition to which the Clyde has secured a fair number. A fairly large percentage of the total tonnage is for Liverpool owners engaged in regular trades, but not a few vessels are for owners who have hitherto confined themselves to sailing vessels, and no doubt they are intended for the tramp trades. The freight market is suffering from excess of tonnage, and of course the large addition to the number and tonnage of the mercantile service which the present building program will entail, must be against any improvement in rates unless trade conditions are greatly stimulated.

News From the Launch Makers.

The Dutton Engineering Co., Perth Amboy, N. J., are building a launch for Warren Cowles, Peoria, Ill., to be 22 ft. long over all and 4 ft. wide of speed model underbody boat with liberal free board, especially forward. The engines are two cylinder Dutton placed at the forward end of the cockpit, the fly wheel being on the other end of the engine so that all means of starting and adjustment are immediately in front of the steersman. The engine runs at 700 revolutions per minute, developing 7 H. P. The boat is expected to be dry and comfortable and to have considerable speed for its size. On the present page will be found a picture of the Lahuska built by the Dutton company for P. M. Shurples, Westchester, Pa., for use around the Thousand Islands. The Lahuska is 32 ft. 6 in. long and is equipped with a 10 H. P. Dutton engine.

Built by the Miamus Motor Works, Miamus, Conn.

REFLECTIONS IN THE WATER.
[*Product of the Pierce Engine Co., Racine, Wis.*

The Racine Boat Mfg. Co., Muskegon, Mich., report that the motor boats which they have under way from 15 to 45 ft. in length are too numerous to mention and that they are working twenty-four hours a day, running two shifts to take care of the demands made upon them. Among the craft is a racing machine for Mr. Glasgow of Buffalo. It is 35 ft. long, 4 ft. 6 in. beam and is equipped with a four-cylinder four-cycle motor, which when turning up to 700 revolutions per minute will develop 40 H. P. and is designed to give the boat a speed of 20 miles an hour. The boat is lightly built and is double planked, the inner planking being of cedar and the outer plank of mahogany.

LAHUSKA AT THOUSAND ISLANDS, OWNED BY P. M. SHURPLES, WESTCHESTER, PA LENGTH 32 FT., BEAM 6 FT., 10 H. P. DUTTON ENGINE, SPEED 11 MILES PER HOUR.

Read Bros., yacht and boat designers and builders, Fall River, Mass., have just finished a steamer 65 ft. long, 15 ft. beam and 6 ft. deep, equipped with a fore and aft compound engine 18 and 14 by 12 in. for the food fishery business, which is carried on very extensively off the Newport coast. The company has also built a motor boat 43 ft. long, 11½ ft. beam and 4½ ft. deep, equipped with a 20 H. P. Standard motor for use in Newport harbor. The company is now making extensive repairs to the Lake torpedo boat Protector and are fitting out several steamers for the food fishery business.

Several of the products of H. J. Leighton, of Syracuse, N. Y., have distinguished themselves in racing. Among those may be mentioned the following: Zaza, 35 ft. by 5 ft., with a 25 H. P. motor and a speed of 18 miles, owned by William J. Serrell of Bayonne, N. J.; Alkimos, 36 ft, by 5 ft., 18 H. P., speed 20 miles, owned by E. C. McGraw of Pittsburg, Pa.; Carmencita, 55 ft. by 6 ft., 60 H. P., speed 20 miles, owned by D. H. Lyons, Ogdensburg, N. Y.; Priscilla, 55 ft. by 6 ft., 60 H. P., speed 20 miles, owned by H. A. Richards, Dover, Del.; Pink, 22 ft. by 4 ft., 7 H. P., speed 14.8 miles, owned by J. Wainwright, Philadelphia, Pa.; Overbrook, 37 ft. by 6½ ft., 25 H. P., speed 15 miles, owned by J. Wainwright, Philadelphia, Pa.; Kittiwake, 40 ft. by 6 ft., 25 H. P., speed 16.8 miles, owned by J. H. Johnston, Clayton, N. Y.; Hagenegath, 37 ft. by 5 ft., 25 H. P., speed 19 miles, owned by A. T. Hagen of Rochester, N. Y.; Arrow, 36 ft. by 5 ft., 18 H. P., speed 15 miles, owned by H. D. Camp, Ful Cain, N. Y.

S. C. Wicks & Co., of Patchogue, L. I., have nearly completed an auxiliary yawl of modern design, 132 ft. over all, for M. W. Torrey of New York city. She is equipped with a 3 H. P. gasoline motor. The company has also built a 32-ft. yawl, designed by G. H. Miller, for Benjamin M. Wallace of New York, to be equipped with a 6 H. P. kerosene motor. A 36-ft. auxiliary yawl is being built for L. A. Schmalholz of New Brunswick, N. J., to be equipped with a 5 H. P. gasoline motor. William Hitz of Washington, D. C., is having built a 32-ft. yawl from designs by W. C. Appleton of Boston. Mr. G. H. Miller of Patchogue is having built a 36-ft. auxiliary yawl, to be equipped with a 6 H. P. Bridgeport motor.

The Vingt-et-Un and the Fiat are to race under the auspices of the Larchmont Yacht Club for a $2,000 challenge trophy. Smith & Mabley, the owners of the Vingt-et-Un, and Hollander & Tangeman, the owners of the Fiat, have arranged the terms for this race and each firm is now having a boat built especially for it. The Smith & Mabley boat is being built by design from Tams, Lemoine & Crane. The Electric Launch Co. is building the new boat

for Hollander Tangeman. This race will undoubtedly attract national attention.

J. A. Lynn, Good Ground, L. I., is having built a 25-ft. 5 H. P. boat by the Lozier Motor Co.

David M. Little, Salem, Mass., has just built a 30-ft. sloop of Burgess-Packard design for T. J. Lathrop of Boston.

E. A. Richards of New York has ordered a 40-ft. semi-racing boat, fitted with a 30 H. P. engine from the Lozier Motor Co.

The Lozier Motor Co. is building a 25-ft. half cabin launch for a resident of Brazil. It will be finished inside in white enamel and gilt and will be named the Presidente.

The United States Auto Boat Co. of Jersey City, N. J.,

PINK, 22 FT. LONG, 4 FT. BEAM, 7 H. P. MOTOR, SPEED 14.8 MILES.

[Built by H. J. Leighton, Syracuse, N. Y.

is building a 30-ft. launch for Mr. J. H. Flagler of the New York Yacht Club. The hull is to be of mahogany and oak.

Alexander Stein of New York has ordered a racing motor launch from the Electric Launch Co., from designs by Morgan Barney. She will be equipped with a 14 H. P. Buffalo motor.

The Neptune Launch & Mfg. Co., Evansville, Ind., are building a number of launches 18 and 21 ft. in length, both fantail and torpedo. They have also under way a 30-ft. torpedo model cabin launch.

The Frank M. Watkins Mfg. Co. of Cincinnati report that they are building a tunnel launch which they claim is one of the finest on the Ohio river. They expect to have it running about the middle of May.

TWIN-SCREW 32 FT. LAUNCH EQUIPPED WITH A 2 H. P. MODEL ENGINE.

[Built by S. C. Wicke & Co., Patchogue, L. I.

Burgess & Packard of Boston have an order for an automobile boat for H. L. Boulden of Waltham, Mass. She is to be fitted with a 50 H. P. engine. Contract for the construction of the hull has not yet been let.

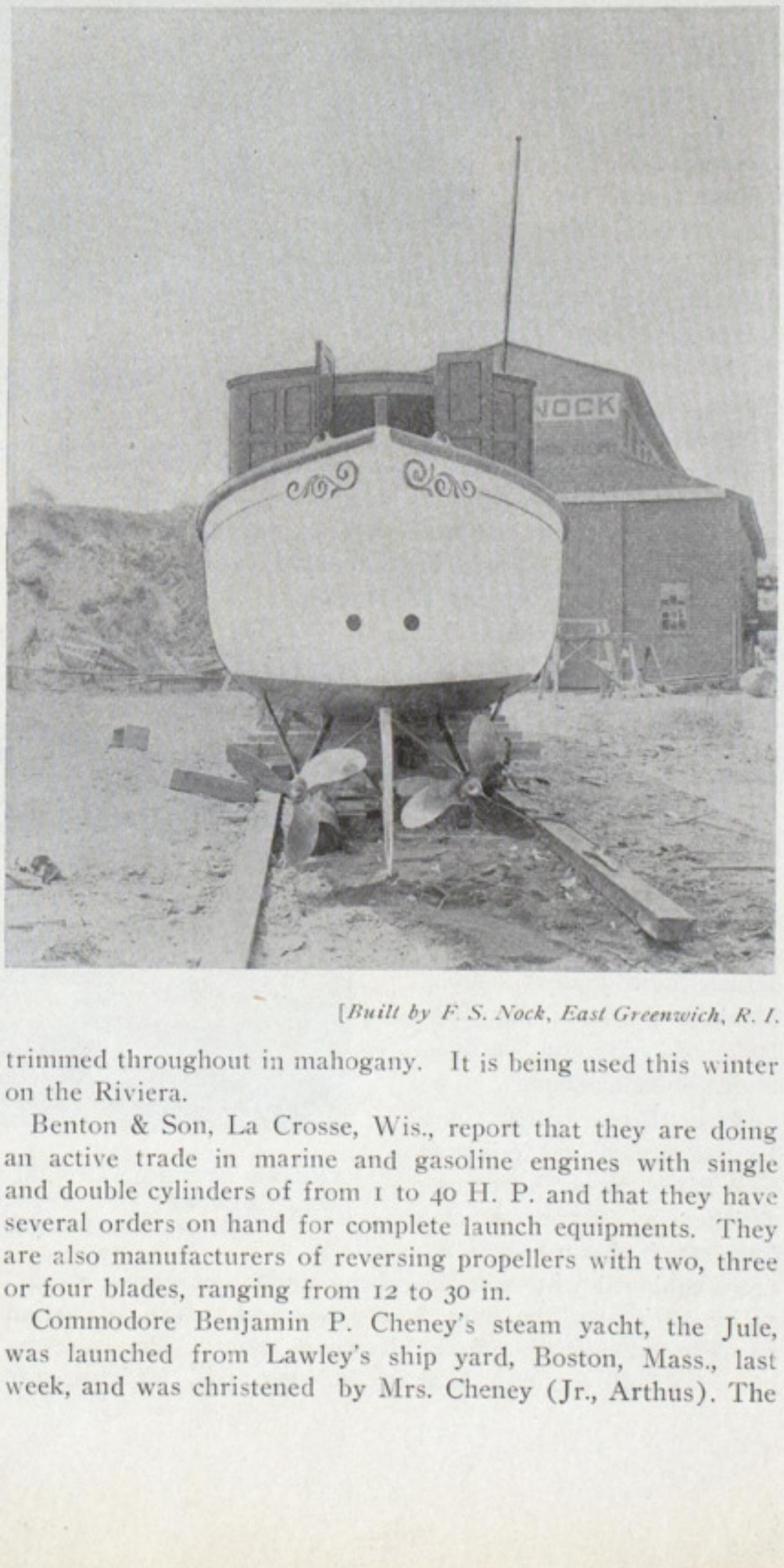
H. E. Boland of Chicago is having built at Lawley's yard, East Boston, Mass., a motor boat 102 ft. long, to be equipped with a 300 H. P. motor. This vessel will cost about $100,000 and will be one of the most complete of her kind in existence.

The New England Motor Co., Lowell, Mass., are manufacturing a marine type of electric motor for use with storage batteries in launches. This machine is designed to give 3 H. P. at 500 revolutions per minute and use of the multipolar waterproof type.

The fact that Mr. Morton F. Plant's schooner yacht, the Ingomar, is to compete in foreign yacht regattas lends interest in them from the American point of view. The Ingomar, which has been changed from a centerboard to a keel boat, will be sailed by Capt. Charles Barr.

Wycoff Bros., Clinton, Conn., are building a fast launch for Capt. John J. Phelps, who made two cruises around the world in the schooner yacht Brynhilde. The launch will be 43 ft. over all, 43 ft. on the waterline, 6 ft. beam and 6 in. draught. She will be used around the Thimble Islands.

Capt. Cosci, Sovona, Italy, is the owner of a most unique and handsome motor boat equipped with a 10 H. P. double cylinder two cycle Lozier engine. The launch is 34 ft. 6 in. in length over all, with a beam of 5 ft. 8 in. and is finished and



[Built by F. S. Nock, East Greenwich, R. I.

trimmed throughout in mahogany. It is being used this winter on the Riviera.

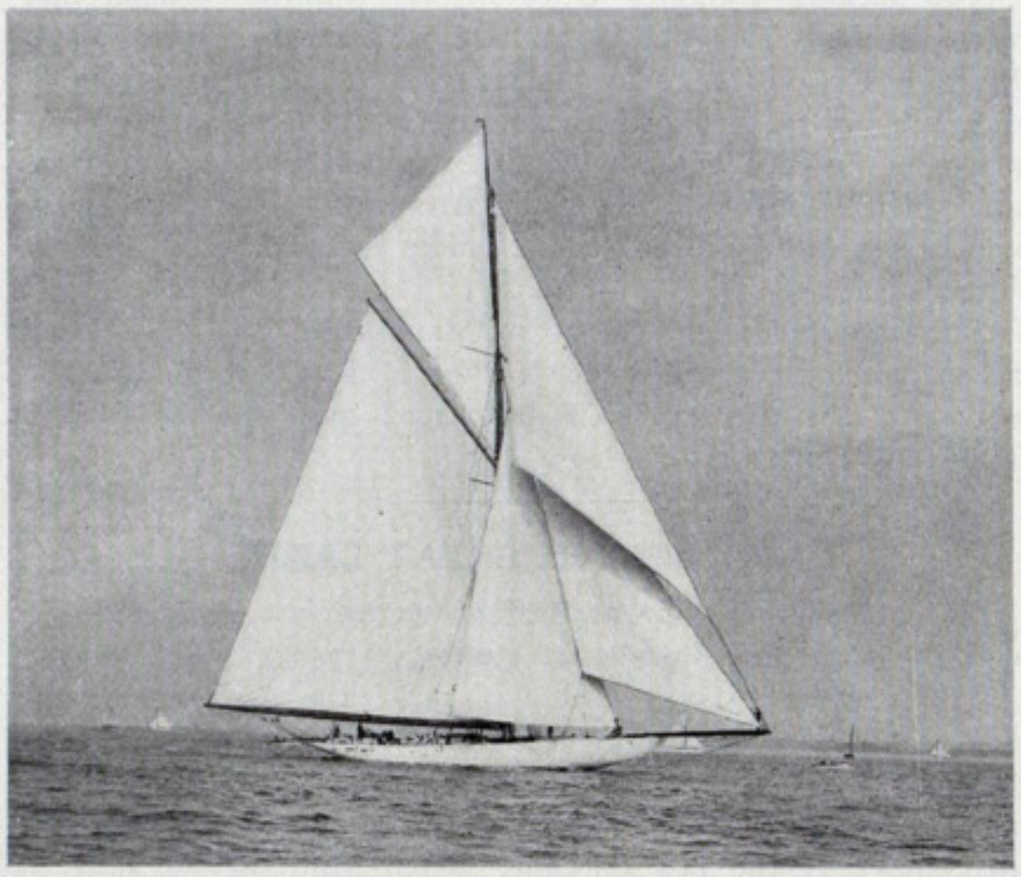
Benton & Son, La Crosse, Wis., report that they are doing an active trade in marine and gasoline engines with single and double cylinders of from 1 to 40 H. P. and that they have several orders on hand for complete launch equipments. They are also manufacturers of reversing propellers with two, three or four blades, ranging from 12 to 30 in.

Commodore Benjamin P. Cheney's steam yacht, the Jule, was launched from Lawley's ship yard, Boston, Mass., last week, and was christened by Mrs. Cheney (Jr., Arthus). The

Jule is 62½ ft. over all, 56 ft. on the water line, 13 ft. beam and 4 ft. draught. She is fitted with a Lawley triple-expansion engine and a Roberts' water tube boiler.

The Grand Rapids Gas Engine & Yacht Co., Grand Rapids, Mich., have quite a variety of work under way, including a 38-1t. speed launch of very large horse power and very narrow beam. They have also built a 26-ft. speed launch of the Tetra Hedral model and are just completing a 35-ft. launch for a New Orleans club. They are introducing quite a number of novelties in their designs.

The Huntington Mfg. Co., New Rochelle, N. Y., is building a number of power boats including a new 30-ft. auto boat, 5 ft. beam, for D. S. Morrell of Hartford, Conn., and a 31-ft. automobile launch for S. S. Thomson of Red Bank, N. J. Both of these are to be fitted with Standard motors. The company

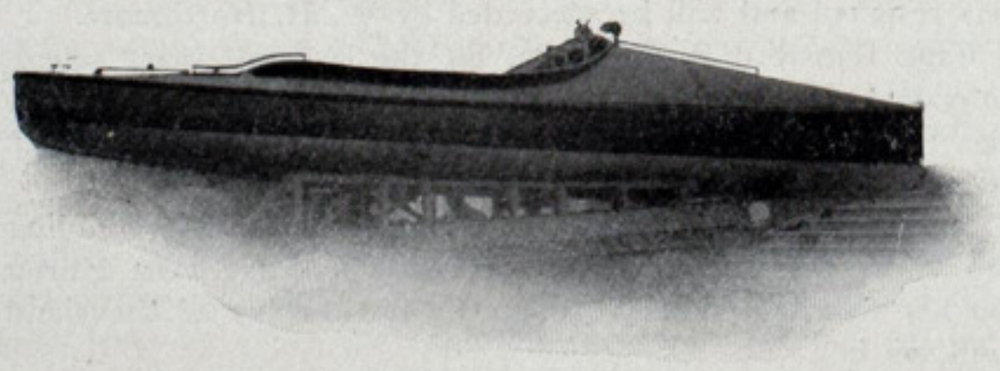


CONSTITUTION.

is also building a 32-ft. auto launch for Mr. H. Newbauer from designs by Tams, Lemoine & Crane.

The Greenport Basin & Construction Co., Greenport, L. I., is building a cabin launch of the following dimensions: 60 ft. over all, 51 ft. 6 in. on the water line, 12 ft. beam and 3 ft. 3 in. draught. She is to have a 40 H. P. Standard motor and a guaranteed speed of 12 miles an hour. The cabin will be mahogany with a ladies' saloon aft. The launch is intended to be used for cruising on Long Island Sound.

The Bay Ridge Launch Works, Brooklyn, N. Y., is building a steel auto launch 30 ft. long by 6 ft. beam, to be equipped with a 16 H. P. motor; a steel cabin launch 33 ft. long by 7 ft. 10 in. beam, to be equipped with a 10 H. P. motor; two



CAPT. CASCO'S LOZIER LAUNCH USED ON THE RIVIERA.

wooden launches 20 ft. long by 5 ft. 2 in. beam, to be equipped with 4 H. P. motors. The company is also building several launch tenders to be fitted with 1½ H. P. motors.

Frederic S. Nock, East Greenwich, R. I., has a number of launches under way, including an automobile boat for an East Greenwich resident, to be 35 ft. on the waterline; a 34-ft. hunting cabin launch for W. B. Otis of Providence, R. I.; a 36-ft. hunting cabin launch for F. W. Allree of Kingston, Ont.; a 35-ft. hunting cabin launch for F. N. Babcock of Centerville, R. I., and a 43-ft. cabin launch for a resident of Buffalo.

The Sarvent Marine Engine Works, 18-30 West Randolph St., Chicago., have recently shipped a stern paddle-wheel boat 36 ft. in length to Mexico. The company has at present under way in its works quite a number of small orders, including twc 24 H. P. engines for a twin-screw passenger boat for South Haven, a 32 H. P. engine for Mexico and a 30 H. P. for California, besides a number of 3 and 7 H. P. outfits for the inner lakes.

The Pearson Boat Construction Co., Duluth, Minn., reports that their business this year far surpasses any previous year, the major portion being in launches from 16 to 25 ft. in dimensions. The company has just shipped 30 and 35 footers to Norfork, Va., two 38-ft. cabin launches to Spokane, Wash., and is building several larger launches for Lake Superior and a 65-ft. cabin launch for Florida. The company's output is one launch a day and eight row boats and deliveries cannot be promised until after June.

Palmer Bros., at Cos Cob, Conn., report that they have their usual share of the boat and engine business. They have at their works about 100 launches and have also some cabin boats in course of construction. They have just finished a 35-ft. auto boat for experimental purposes and have just built a 35-ft. speed launch for Mr. E. Hill, president of the Norwood Iron Works, from designs by him. This launch is equipped with the company's new 18 H. P. four-cylinder high speed jump spark motor.

The C. B. Mather Corporation, Rowley, Mass., have a number of orders for dory launches, yacht tenders and row boats, together with the following launches: 37½ ft. speed launch, 8 H. P. Buffalo motor; 25-ft. speed launch, 8 H. P. Essex motor; 25-ft. launch, 5 H. P. Howard special motor; 30-ft. launch, 10 H. P. Lathrop motor; 22-ft. launch, 3 H. P. Palmer motor; 33-ft. hunting cabin launch, motor not decided on; two 16-ft. mahogany tenders, 3½ H. P. DeDion automatic automobile motor; 22-ft. speed launch, motor not decided on.

The Auto Boat Co., West Mystic, Conn., have a great deal of work under way. They are building an auto boat 35 ft. 6 in. long for C. P. Williams of Stonington, Conn., to be equipped with a 16 H. P. Hasbrouck motor; a cruising trunk cabin launch 30 ft. long for George G. Williams of Hartford, Conn., to be fitted with a four-cylinder four-cycle Hasbrouck motor; auto boat Neola, 35 ft. long, to be used as a tender for G. M. Pynchon's bronze sloop Neola; a 30-ft. auto boat for George W. Townsend, New Haven, Conn. All these boats have been designed by Mr. C. D. Holmes, West Mystic, Conn.

Probably about as interesting an event as will occur in American waters this year will be the trial of speed between the Kanawha, owned by Mr. H. H. Rogers, and the Haouli, owned by Mr. F. M. Smith. Elsewhere in this number will be found a complete description of the Kanawha. When she was acquired by Mr. Rogers he took her into the lower New York bay and picked out the swiftest vessel afloat for contest of speed. This was the Monmouth of the Sandy Hook line, which in the day's work runs from the Highlands to Manhattan, a 22 mile stretch, in a few minutes over the hour. One day the Kanawha ran up to her and fought her foot by foot over the stretch, finally pushing her nose ahead and finishing well in advance of that flyer. These contests were continued until it was clearly manifested that the Monmouth was no match for the Kanawha. In fact, there is nothing in New York waters as swift as the Kanawha, with the exception, of course, of a couple of racing machines and the government torpedo boats.

Steamship men of New York are disheartened over the refusal of Secretary Taft to reopen the question of lengthening the North river piers.

LAKE SITUATION—ORE OUTPUT.

The executive committee of the Lake Carriers' association will meet today (Thursday) with the Masters & Pilots' association, and while, of course, the outcome of the meeting cannot be foretold, it is quite likely that an agreement will be reached between them. Since the breaking up of the last conference there has been a great deal of agitation among the masters, and it is expected by the owners that they will modify their demands. The owners maintain that they could not afford to accept the clause forbidding the discharge of a master without a hearing before an arbitration committee. If this should be granted to the masters, it would undoubtedly be followed by similar demands from members of the other unions—that a member of a crew could not be discharged without a hearing before an executive committee. The master would therefore lose absolutely all control of his ship. The owners will insist that this provision be stricken out and in all probability the masters will realize that the demand is an untenable one.

Contracts for the season have been signed by the Marine Firemen, Oilers & Tenders' association with the executive committee of the Lake Carriers' association. The schedule is slightly lower than that which obtained last year. The men will receive $45 a month to Oct. 1 and $65 a month for the balance of the season. Last year they received $47.50 up to Oct. 1 and $65 for the latter part of the season. The members of the executive committee speak very highly of the delegates from the Firemen, Oilers & Watertenders' association, saying that they were disposed to be fair minded throughout.

No agreement has as yet been reached with the Lake Seamen's union, though it is quite likely that one will be shortly. The union has abandoned its demand for extra wages for work performed in port, but has insisted that all of the donkey men on all the large steel barges be members of their union. The firemen and oilers made the same demand, but it was not granted. The donkey men are members of various organizations, and, of course, the vessel owners could not insist upon their belonging to one union or the other without provoking endless trouble.

A meeting of the members of the Bessemer Ore association was held in Cleveland on Tuesday of this week, and it was concluded to have no agreement for the season. This means that the mine owners and sales agents in the Lake Superior district will make their own prices and that the output will depend entirely on the demand. At a meeting held in New York recently, it was virtually agreed to make the price of standard Bessemer $3.50 for the season, but no agreement was at that time reached regarding the output. The producing consuming interests would not limit the product of their properties to an amount that the merchant products considered equitable, so that it is questionable whether prices will hold at the New York agreement.

There is as yet no talk of carrying charges and probably no season chartering will be done until the labor question is settled. Receipts of coal at Lake Erie docks continue to be liberal and shippers are securing all available tonnage for the first trip north. It is expected that the Lake Superior docks will be quite clear by the time navigation opens, but as every carrier appears to be chartered for coal for that trip, there is likely to follow a temporary congestion there.

WITH THE LAKE SHIP YARDS.

Today (Thursday) is something of a gala day among the ship yards of the great lakes. The American Ship Building Co. will launch at its Lorain yard the Sahara, building for G. A. Tomlinson of Duluth. The Sahara is exceeded in size only by the Augustus B. Wolvin, which was launched on April 9 last. The novelty in the construction of the Sahara rests in the substitution of the arch girder plate for stanchions. These girder plates are fastened athwartships between the hatches to web frames.

The Great Lakes Engineering Works, Detroit, Mich., will launch the cargo steamer R. W. England, building for Frank Seither and others. This is the first steamer to be constructed by this company and is, therefore, a matter of more than usual interest. A great many people will undoubtedly be present to witness the launch.

At the yard of the Craig Ship Building Co., Toledo, the freight and passenger steamer Indianapolis will be launched for the Indiana Transportation Co., Michigan City, Ind. Quite a social event will be made of this launch. The company held a voting contest to determine who should have the honor of naming the vessel and the choice fell to Miss Eula Clay of Indianapolis.

The package freighter Utica of the Western Transit line was launched from the Wyandotte yard of the Detroit Ship Building Co. on Thursday of last week. The Utica is 345 ft. over all, 325 ft. keel, 44 ft. beam and 28 ft. deep. She will be propelled by quadruple-expansion engines with 19, 27½, 40 and 58 in. cylinder diameters by stroke of 42 in. The steam will be supplied by three Scotch boilers equipped with Howden forced draft.

The Manitowoc Dry Dock Co., Manitowoc, Wis., has closed a contract for a $20,000 steel tug for F. B. Chesbrough. The company will also build a $25,000 steel scow for the Duluth Dredge & Dock Co.

AROUND THE GREAT LAKES.

The lifesaving station at Buffalo opened last week and will continue until the close of navigation.

The steamer City of Erie will make the first trip of the season on Saturday night, leaving Cleveland for Buffalo at 8 p. m.

The Standard Contracting Co. of Cleveland will raise the machinery of the tug Cascade, which sank off the port of Lorain last January.

Capt. John H. Collins, master of the barge Madeira, died at his home in Cleveland this week from pneumonia. He was forty-three years old.

The name of the steamer E. P. Wilbur of the Lehigh Valley Transportation line has been changed and will be known hereafter as the Bethlehem.

The grain elevators at Buffalo suspended operations this week, throwing 200 men out of employment, owing to the backwardness of the lake season.

The machinery of the sunken steamer Glidden in the St. Clair flats canal has been entirely removed and Wrecking Master H. W. Baker is now at work removing the hull.

J. C. Fitzpatrick, general agent for the Lake Michigan & Lake Superior Transportation Co. for the past year in Duluth has resigned and will be succeeded by W. H. Northmore.

Capt. Ransford B. Buckman, for the last two years superintendent and navigating officer for Cramps of Philadelphia, has just been appointed naval adviser to the Turkish minister of marine.

The steamer F. B. Squire, built by the Jenks Ship Building Co., Port Huron, Mich., will be ready to leave Port Huron on her first trip shortly. Capt. J. A. Greenley of Cleveland will sail her.

The steamer S. C. Baldwin, which was wrecked last fall with a cargo of lumber, has been raised and towed to Green Bay. It is estimated that it will cost about $10,000 to put her in good condition.

The steamer Kanawha will leave the lakes and engage in the phosphate rock trade from South Carolina to Baltimore. She will be commanded by Gust Atkinson, who will secure a crew on the Atlantic seaboard.

Capt. Duncan McLachlan, Chief Engineer J. P. Wells and Purser John S. Grew will occupy their respective positions on

the steamer Eastern States, while Capt. Frank Stewart, Chief Engineer A. Carter and Purser B. A. McIntrye will have charge of the steamer Western States.

Chief Engineer Rogers of the Lehigh Valley Transportation Co. has announced the appointment of the following engineers for the Lehigh Valley fleet: Mauch Chunk, D. H. Fox; Wilkesbarre, H. Mellon; E. P. Wilbur, Henry King; Saranac, Harvey Wilson; Tuscarora, John Lehaly; Seneca, John Halldin.

The steamer Kanawha has been chartered for a cargo of corn from Chicago to New York without breaking bulk. This will be the first cargo of corn to be shipped direct from Chicago to New York for a great many years. Three years ago a fleet of four vessels operated in the general merchandise trade on this route, but abandoned it after making one trip each.

As a last act the conference committee of both houses struck out the item from the sundry civil bill appropriating $12,000 for a new mail boat for the Detroit marine post office, and in its place allows $4,500 for the service for the season. This is the same as was paid last year, and of course means that the postal department at Detroit will have to charter a vessel again. This is simply penuriousness with a vengeance. If $12,000 could ever be well employed it could be by providing an adequate and competent boat for the marine service at Detroit, which is one of the most important services rendered to shipping on the great lakes. An ordinary congressman might be excused from not knowing anything at all about it, but why Congressman McMorran should have opposed this passes understanding.

SINGULAR ACCIDENT TO A NEW YORK FERRY.

A most singular accident occurred on board the East river ferry boat America as she was crossing from New York city to Williamsburg last Thursday evening. Just after the ferry left the New York slip, Charles Kelley, the engineer, was stricken with heart disease and died. No one was with him in the engine room at the time and no one suspected anything amiss until the pilot gave the customary two bells to slow as the ferry was nearing the Brooklyn slip. No response came and the pilot repeated the call. Then as the engines failed to reverse, he leaped to the speaking tube to ascertain the cause, just as the ferry, going at full speed, struck her port side against the slip and listed until her rail went nearly under water. There was a terrific grinding and crashing of timbers and the hundreds of passengers aboard were thrown from their feet. The ferry then struck the other side of the slip and tore away the whole of her starboard rail, together with a great part of the men's cabin. Then she went forward at full force and struck the landing bridge squarely. The impact of the shock was such as to throw her back a number of feet, but, of course, as her engines were still going at full speed she again went forward and struck the bridge with great violence. Meanwhile everyone on board, including the horses, was in a state of panic. The ferry struck the bridge four times before Edward Flanagan, a fireman, who was stoking in the hull, was able to climb up into the engine room to ascertain why the engineer was not reversing the engine. Kelley, the engineer, was on the floor with his dead hand gripping the base of the hand lever by which the engine is reversed. He shut off the steam and brought the wreck of the ferry to a standstill. While scores of the passengers were bruised it is extraordinary that none of them was seriously injured.

The local bureau of the steamboat inspection service took action on the matter and has addressed a circular letter to the superintendents of all the ferry companies of New York, requesting that in future either an oiler or a fireman be kept continually in the engine room with the engineer while the ferry boat is in transit. There is a law now compelling ferry companies to carry two pilots, owing to the fact that a pilot died in the pilot house under somewhat similar circumstances accompanied with similar results, some years ago. There is no law, however, that requires the companies to carry double crews of engineers, but undoubtedly the request of the steam inspectors will be obeyed, as the law gives the inspectors discretionary power of wide latitude.

CLAIRTON STEEL CO. PURCHASED.

Negotiations for the purchase of the Clairton Steel Co. by the United States Steel Corporation have now been completed. Judge E. H. Gary, chairman of the executive committee of the Steel Corporation makes the following official announcement concerning the transaction:

"The United States Steel Corporation has contracted with the Crucible Steel Co. for the purchase by the former of the properties controlled by the latter, known as the Clairton Steel Co. properties. They consist of about 150 acres of land located on the Monongahela river, between McKeesport and Donora, 17 miles from Pittsburg, on which there have been completed and are now in operation three blast furnaces, twelve open-hearth furnaces, one 40-in. blooming mill and one billet mill, together with necessary shops, power plants, etc. Also included in the purchase are 2,907 acres of good coking coal lands in Fayette county, Pa., Champion Iron Co. properties on the Marquette range, including 20,000 acres in fee and a large tonnage of ore already developed, one half interest in Clairton mine, the Little & Prindle iron mine, 51 per cent of the stock of the St. Clair Limestone Co., about 14 acres of land adjoining the steel plant on which are located 140 dwelling houses; also the total capital stock of the St. Clair Terminal Railroad Co., which has built and owns a new double track steel bridge across the Monongahela river, and which railroad connects the manufacturing plant with trunk lines of railroads on both sides of the river. Also included in the purchase are cash, notes, bills receivable, and inventory, of the total guaranteed cash value of $2,619,000. The manufacturing plant is new, modern, just finished, and first class in every respect. The plant has a capacity of about 475,000 tons of pig iron per annum, and about 300,000 to 350,000 tons of billets and slabs per annum. The ingot capacity is about 400,000 tons per annum. The property will be paid for by the guarantee by the United States Steel Corporation of the securities heretofore issued by the Clairton companies, aggregating a little less than $13,000,000, and the delivery to the venders of United States Steel Corporation ten 60-year 5 per cent sinking fund gold bonds of the par value of $1,000,000. The properties are acquired free and clear of all floating liabilities or indebtedness. A contract also has been made with the Crucible Steel Co. whereby the latter will receive and take from subsidiary corporations of the United States Steel Corporation for a term of ten years about 120,000 tons of steel per annum, and about 80,000 tons of pig iron per annum, on a sliding scale of prices. Negotiations for the purchase and sale of these properties have been pending to a greater or less extent during the past year; but until the present time an agreement could not be reached. The property has been contracted for after the most critical and painstaking examination by the experts of the United States Steel Corporation and subsidiary companies, and has been secured at a price materially less than its cost to the Crucible Steel Co.; and as to the manufacturing properties at a price much less than the same could be duplicated for at the present time."

A twin-screw sludge-barge which Wm. Beardmore & Co. are to build for the Glasgow Corporation Sewage Works will carry 1,000 tons, and will be fitted with triple-expansion engines and boilers working at a pressure of 180 lb. per square inch. And Lobnitz & Co. are to build for the Suez Canal Co. a hopper dredger larger than any afloat. This dredger is of the bucket type, and very powerful.

MARBLEHEAD YACHT YARD'S PRODUCTS.

At the Marblehead yacht yards of Stearns & McKay, Marblehead, Mass., during the past season a number of new boats have been turned out. Among the power boats the 50 ft. waterline auxiliary ketch which the firm designed for southern parties will be started as soon as possible by Messrs. Rice Brothers Co. of East Boothbay, Me., to whom Stearns & McKay have given the order for building. She will be a seagoing vessel fitted with 20 H. P. engine and will be heavily built. The draught, including keel, will not exceed 3 ft. 6 in., as the vessel is to be used largely for cruising in the unfrequented part of the West Indies. An iron shoe will be employed to serve to protect the wooden keel in case of grounding. She will be equipped with 20 H. P. engine and is expected to develop 10 knots under power. She will be fitted up for long cruises and will have ample room to accommodate six people besides the captain and accommodations forward for engineer, and crew of two in forecastle.

The 37 ft. over all speed launch built for Mr. L. F. Percival, which has been recently launched, made 15 miles on her trial trip. The engine however has not done her best work and it is expected this speed will be materially increased. The design is along the freak or Dolphin type but with such modifications that the boat proved herself a seaworthy and able craft.

37 FT. OVER ALL, LAUNCH FOR S. PERCIVAL, BOSTON, MASS.
[Built by Marblehead Yacht Works, Marblehead, Mass.

In place of the square bilges and sharp corners at the waterline of the out and out Dolphin type, the company has materially softened the bilges and introduced as much flare as possible. The stern has been cut off diagonally after the French practice. The construction is rather novel but the result was an absolutely watertight hull, great strength and a degree of lightness which is seldom obtained in substantial construction. The engine is a four-cylinder machine which was rated at 15 H. P. but which should under proper condition develop considerably more. So far the propeller used has been of reversible pattern which has not been entirely satisfactory. A solid propeller will undoubtedly give better results and if this proves to be the case the reversible one will not be used for racing.

The 17-ft. launch also built for Mr. Percival is one of the most interesting types of these small boats in these waters. She is fitted with only a 2½-H. P. engine but is very able, seaworthy and fast. The boat is handsomely and very strongly built, finished in mahogany and presents a very stylish appearance. A number of these boats are used in this vicinity although they were primarily intended to carry on the davits of the larger yachts.

The firm is also building a 35-ft. launch from designs of Messrs. Small Brothers of Boston. This boat will be a handsome and complete affair. She is fitted with two cockpits and heavily built.

A number of inquiries have been received from abroad during the past winter. The firm are at present corresponding with parties in Spain with a view to designing and building a 33-ft. hunting launch for use in cruising on the Mediterranean.

Designs have also been made for Mr. Roger Upton, a well known local yachtsman, for a 33-ft. hunting launch equipped with a 10-H. P. Fay & Bowen engine. Especial attention will be paid in this boat to strength and seaworthiness. The boat will be fitted comfortably for cruising. She will be on the general idea as to the lines as the other hunting launches now building by the firm except in place of the trunk cabin the turtle back idea may be used.

HUNTING LAUNCHES

The Marblehead Yacht Yard, Marblehead, Mass., are putting on the market this year a hunting launch which is meeting with special favor. The general features of the boat are as follows: Length over all, 26 ft.; breadth, extreme, 6 ft. 5 in.; draught, 2 ft.; head room in cabin, 4 ft. 4 in. Two transoms 6 ft. 6 in. long by 21 in. wide are fitted in cabin with clothes locker at head of each. At the forward end of cabin is a large locker under sideboard. Above this locker is another one for cooking utensils. In the interests of safety especial care has been taken in the installation of the engine and tanks so that there would be no danger of an explosion. The tank is situated behind a tight bulkhead and the whole compartment is in free communication with the sea so that if any leak takes place, it will simply run overboard and not into the boat to generate gas and make an explosion the first time a light is struck in the cabin.

The engine, a 5 H. P. Union motor, made by the Eagle Bicycle Mfg. Co., is under the steps perfectly protected from the weather yet not jutting into the cabin with the disagreeable accompaniment of oil and grease if not kept scrupulously clean; out of sight and where the noise of its running will be greatly deadened, yet in such a position that by swinging the hinged steps and lifting the lid directly over the engine every part is directly accessible.

The cockpit is arranged with comfortable seats, the one at the end with the inclined back being exceptionally easy. Steering gear is an automobile wheel situated in any convenient part of the side of the cockpit The hull is very well built, strong, but finished perfectly plain.

The steamer Monadnock, which has gone round to the Tyne for repairs, has so far been an unfortunate ship. After one voyage she went ashore last spring in the Sound of Mull, and sustained a great amount of damage. On being refloated she was taken to the James Watt dock, Greenock, where she remained for some time, and was then laid up in the Gareloch. Here she rode very badly at anchor owing to her bows being so high out of the water, her stem having been hove up when on the rocks at Mull, and she again went ashore. She was again brought to the James Watt dock, where she lay for some months. Then Scott & Co. stiffened her for the voyage round the north of Scotland to the Tyne, where the repairs, which it is stated will cost close on £30,000, will be carried out by the Tyne Pontoons & Dry Docks Co.

TRUSCOTT BOAT MANUFACTURING CO.

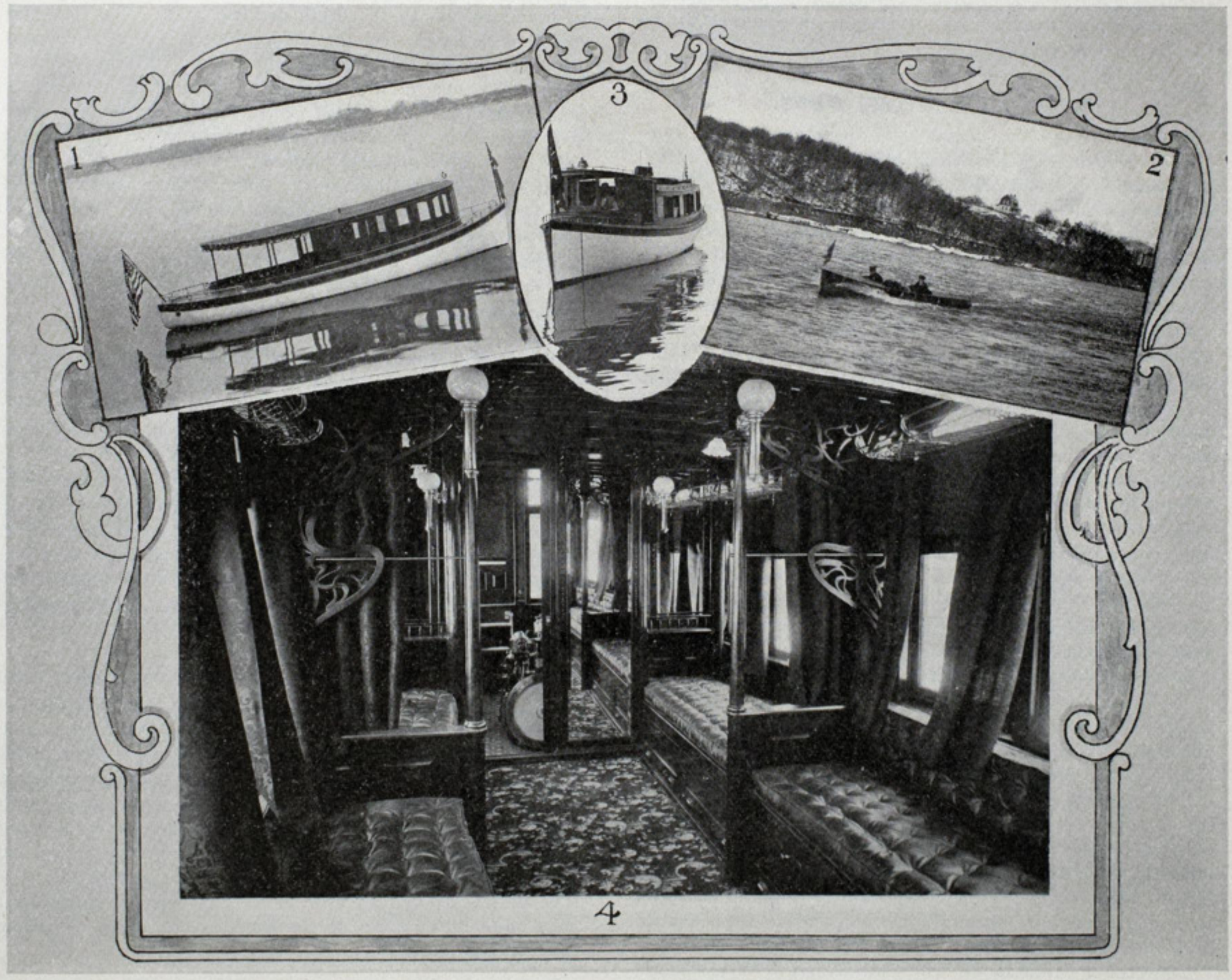
[*Built by the Hunter Boat Mfg. Co., Chicago, Ill.*

The Truscott Boat Mfg. Co., St. Joseph, Mich., are extremely busy. This company has just sent a train load of cars to the world's fair at St. Louis. The boats designed by this company are well thought out and are really scientific creations. Especially is this true of the Dispatch, 28 ft. long, 3½ ft. beam, weighing 350 lbs. and driven by a four-cylinder four-cycle motor of 16 H. P. The Dispatch was built for racing exclusively and has been designed solely to that end. Especial care was taken in her construction to make it as light as possible without sacrificing strength. It is claimed to be the lightest boat of its speed and power in the world. A picture of the boat is given in the group devoted to the Truscott Boat Mfg. Co.'s product. It will be noted that the lines are very sharp forward with considerable width aft and a square stern. The draught of the hull with full equipment and two persons aboard is only 5 in. The motor is situated in a very small cockpit amidships.

MR. DONALDSON MANAGER OF LAKE SHIPMENTS.

The appointment of John A. Donaldson to the position as manager of lake shipments for the Pittsburg Coal Co. and the return of Mr. A. W. Horton to the management of the western sales department is undoubtedly a change in harmony with the best interests of the big soft coal organization in the lake region. Before coming to Cleveland to take charge of the movement of coal by lake for the Pittsburg company, Mr. Horton had been highly successful in the important work of selling and distributing in the west and northwest the product of some of the largest of the Pittsburg coal properties, so that he has already mastered the branch of the business which he is again taking up. Mr. Donaldson's training, on the other hand, has been almost entirely in the department of lake shipments. In the management of Lake Erie docks and the large forces of labor employed on these docks he has no superior. He is an untiring worker, conversant with every detail of his new position and very popular with the vessel men.

The steamer F. A. Kilburn, built by the Fulton Iron Works for the Watsonville Transportation Co., made her trial trip on Tuesday, April 12th, and gave perfect satisfaction. She is a 14-knot vessel and was built to carry freight from Pajaro Valley, Cal., to San Francisco.



PRODUCTS OF TRUSCOTT BOAT MFG CO., ST. JOSEPH, MICH.

1. 50-ft. Compromise Steam Launch.
2. 28-ft. Speed Launch, 24 H. P., actual speed 18 miles
3. An Ideal Small Cruiser.
4. Interior of Truscott Launch.

LAUNCH OF ARMORED CRUISER CALIFORNIA.

The armored cruiser California was launched from the ship yard of the Union Iron Works, San Francisco, Cal., on Thursday last. The great ship was released by Mrs. Walter G. Martin, daughter of Henry T. Scott of the Union Iron Works and was christened by Miss Florence May Pardee, daughter of Gov. Pardee of the state of California. The cruiser California is supposed to embody the latest and best in vessels of her class. There are to be five vessels like her, but at present the nearest approach to her on any waters is the model British cruiser, Drake. The construction of the cruiser was authorized by congress March 3, 1899, and the contract for her construction was let about a year later.

She will cost, complete, $5,000,000, her hull and machinery costing, $3,800,000 of that sum, her equipment and armament the remainder. The principal dimensions are: Length on load water line, 503 ft.; extreme breadth, 69½ ft.; mean draught, 24 ft., and displacement, 13,440 tons. She will have twin screws and triple-expansion engines of 23,000 H. P., capable of developing a maximum speed of 22 knots. The cruiser's main battery is composed of four 8-in. rifles placed in two armored turrets, one forward and one aft; fourteen 6-in. and eighteen 3-in. rapid-fire guns. The secondary battery consists of twelve three-pounder semi-automatic guns, four one-pounder automatics, four one-pounder rapid-fire Hotchkiss guns, two 30 centimeter Gatlings, six 30 centimeter automatic Colts, together with two 3-in. field pieces to be used by landing parties.

WORK AT NEWPORT NEWS.

Newport News, Va., April 27.—Much interest is centered here in the race for honors between the Newport News Ship Building & Dry Dock Co. and the Brooklyn Navy Yard, building respectively the 16,000 ton battleships Louisiana and Connecticut. The private ship yard now leads the navy yard by a comfortable margin, notwithstanding work on the Connecticut was started at Brooklyn several months before the navy department awarded the contract for the Louisiana to Newport News. That the private yard will win the race there seems to be no doubt; the question is by how much. As the time for launching the big hulls approaches it is apparent that the government ship builders cannot win. The Newport News company have already demonstrated the superiority of its facilities for rushing a ship on the ways and after it puts the Louisiana overboard it is anticipated that this ship will forge still further ahead of the Connecticut by reason of the superiority of its facilities for handling the work after launching. It is now stated that the government experts do not hope to complete their ship thead of the Louisianan, but are determined to make the best possible showing in competition with the private builders, a showing that is sure to reflect credit on the navy departments corps at the Brooklyn yard. At this time it is impossible to state definitely the time the Louisiana will be launched, but at the present record-breaking rate of advancement it will not be many months before an official announcement will be forthcoming from the shipyard officials relative to the probable date.

It is rumored that the shipyard here will soon be awarded the contract for constructing the monster diving-bell caisson that will be used as the foundation for the proposed new lighthouse at Cape Hatteras—the "Graveyard of American Shipping." When completed the caisson will be towed to Hatteras, sunk and filled with mortar, stone, etc., this to form a huge rock on which the lighthouse will be erected.

The cruiser Minneapolis, with Rear Admiral Wise aboard, after coaling here sailed for Brooklyn navy yard. The training ship Dixie is here for coal. The training ship Prairie is at Old Point.

The Hampton Roads Boat Building Co., with a capital of $10,000 has started operations here. It will build small craft.

CITY OF ATLANTA LAUNCHED.

The steamship City of Atlanta, the latest addition to the fleet of the Ocean Steamship Co. of Savannah, was launched on Saturday, April 30 at Roach's Ship Yard, Chester, Pa. The ship was christened by Miss Jennie English, daughter of Capt. J. W. English of Atlanta, Ga. After the launching lunch for the party was served on the steamship City of Columbus, which later proceeded on her triail trip from Chester, Pa., to New York with various members of the party aboard. The City of Atlanta is a sister ship of the City of Columbus, which was launched in February, and which takes her place in regular service between New York and Savannah this month. It is expected that the City of Atlanta will follow in the regular freight and passenger service of the Savannah line in about three months. The hull of the City of Atlanta is constructed upon the cellular water bottom system, channel steel construction, with channel frames, beams, stringers and ties, and is constructed in the highest class under the United States Standard Steamship Owners & Builders Underwriters' rules, and especial survey by their representative to class A1 for twenty years. Scantling and material used in the construction of the hull were tested to the highest standard by experts of Robert W. Hunt & Co. at the mills, and also received a yard test during construction.

The dimensions of the new steamer are as follows: Length on 12 ft. waterline, 370 ft.; length over all, 396 ft.; breadth of beam molded, 49 ft.; depth molded, 27 ft. The spar and middle deck are of steel, the hurricane deck is of steel covered with asbestos and then planked and covered with canvas, making the passenger deck apart from the freight accommodations and fireproof. Water ballast capacity 916 tons; bunker capacity, 428 tons; cubic freight capacity, 352,206 ft.; deadweight capacity of cargo and coal on mean draught 18 ft. 6 in., 3,500 tons; speed when loaded 12 to 13 knots. There are four decks extending all fore and aft, accommodations for eighty first-class passengers being provided on the hurricane deck, and accommodations for intermediate and steerage passengers on the spar deck. The vessel will be equipped with one triple expansion engine.

A special meeting of the newly elected board of directors of the Maritime Association of the Port of New York was held this week for organization purposes, President C. B. Parsons in the chair. The members of the old executive committee were re-elected as follows: C. B. Parsons, C. A. Griscom, jr., and J. Raymond Smith. The new finance committee was appointed as follows: C. R. Norman, G. B. Lockhart and E. F. Geer. F. H. Norton was re-elected secretary of the board. The following new members were admitted: J. F. Rion, of Henry A. Kessel Co., ship chandlers, and Ludwig T. Ruprecht, of Barber & Co., steamship agents.

No overtime has been worked at any of the British naval establishments owing to the war in the far east, but there is no likelihood of any unpreparedness. The letting out to contract of repair and overhaul work has within a short period brought the fleet into a state of efficiency seldom equalled in modern times. Nearly forty vessels have within three years been most thoroughly renovated and all defects made good, and the new departure, while benefiting private firms, has had a satisfactory effect on the fighting efficiency of the navy. The vessels overhauled now in the first reserve constitute a very powerful auxiliary to the fleets of new ships in various parts of the world.

The sultan of Turkey has telegraphed a complimentary cable to President Roosevelt commending the high character of American ship building workmanship as exemplified in the cruiser Medjidia, built at Cramp's, which lately arrived at Turkey.

UP-BUILDING OF AMERICAN MERCHANT MARINE.

Latterly the Marine Review wrote to a number of prominent men throughout the country calling attention to the condition of the American merchant marine in the foreign trade and asking for suggestions as to means for remedying this condition. It was shown that in 1838, when steam navigation in a commercial sense began, the United States possessed a greater steam tonnage than the United Kingdom. From 1838 until 1860 the United States steadily increased its lead both in sail and steam tonnage over the United Kingdom and was distinctly during the latter year the premier maritime nation in the world. At that time, however, Great Britain, in order to extend the mail service to all the quarters of its empire and to extend its general trade with other countries, adopted the policy of liberal subsidies for mail carriage in steam vessels. Under that policy Great Britain's shipping has steadily grown until it is now far and away the foremost in the world. In 1821, when the foreign trade of the United States amounted to $127,559,607 American vessels carried 88.7 per cent of it. In 1901 when the carrying trade of the United States had reached the enormous total of $2,151,935,411, American vessels carried only 8 per cent of it. It is estimated that the sum of $200,000,000 is annually paid for the carriage of these goods, of which amount less than $16,000,000 is earned by American vessels. The issue is to preserve this trade to the American flag. Following are some of the replies received:

The development of American shipping ought to have the thoughtful attention of every American citizen. The United States tonnage employed in the foreign trade, as reported for 1901, amounted to only 879,595 tons, while the tonnage of American vessels engaged in our coastwise business amounted to 4,582,645 tons. Our coastwise trade is protected from foreign competition, but our tonnage engaged in foreign trade receives no protection, has to compete with foreign vessels that pay less wages to their seamen, and as the construction of these vessels costs much less than the construction of our American vessels their running expenses per ton are considerably less.

There is a bill now before congress, advocating the payment of a reasonable amount, as a subsidy, to American vessels engaged in foreign commerce, in order to develop this important business of our nation on the high seas, thereby adding dignity and power to the United States as well as affording a larger opportunity to young men for maritime business. A nation like ours, with its thousands of miles of sea coast dotted all along with towns and cities, ought to stand first among the nations of the world in its foreign and domestic tonnage. The exhibit which it now presents, sending about 90 per cent of its foreign business in foreign ships, is not an inspiring picture to American citizens. Should not the bill now before congress be passed?

JOHN J. PEW.

Gloucester, Mass., April 22.

The decline of American shipping compared with our growth as a nation and our position in the nations of the world is a national humiliation. What remedies can be applied to advance our maritime influence is a problem. The subsidizing of steamship lines by foreign nations is one large factor in our failure to compete with them. Again, the expense in our steam merchant marine is far in excess of foreign vessels. For instance, take the pay rolls of the various German lines and compare them with those of similar vessels of our own and the result is that the salaries paid the officers and wages paid the men are far below in the German than in our vessels. This is a hard nut to crack. Yet we must face the facts. If we cannot run our ships of equal size with the German on the same economic basis then we will run our ships at a loss when they, the Germans, can run theirs at a profit when freights are low and vessels seeking business. Now what remedies can be applied that will induce capital to build vessels to fly the American flag. Will the government foster it by subsidizing our steamships? Can officers and men be had at figures to compete with rival lines even to the extent of employing foreign officers and men. The above refers mostly to continental trade of the long distance and heavy freight trade to India, China and Australia I think our four, five and six-masted schooners will get their share of business in the next decade. But for light freight and valuable goods steam will take the precedence even in long voyages.

J. W. DOUBLEDAY,
President Empire Worsted Mills.

Jamestown, N. Y., April 14.

The remedies for the wretched condition of the American marine in the foreign carrying trade seem to me to be, first, the promotion, instead of the discouragement, of American trade with foreign countries; second, the reduction of the cost of building American steel ships. These are remedies which look toward freer trade. The logical protectionist's remedy would be a law excluding all foreign vessels from American ports. This method would cause a revival of the American marine until foreign nations retaliated by a law excluding all American vessels from their ports. When this mutual blockade should have been established, the home market principle would, for the first time, have complete application in the United States.

Very truly yours,
CHARLES W. ELIOT.

Harvard University, April 16.

I present, briefly, sundry thoughts and suggestions regarding American shipping, its destruction, and means for its restoration and greater development. That the commerce of a nation so strong, so active and so wealthy as the United States of America should be carried in foreign bottoms is humiliating to every American. Prior to our civil war about 70 per cent of our foreign commerce was carried in American vessels; now, less than ten. This overturn was the result of our years of war and a cotemporaneous revolution in the carrying trade, steam and iron ships supplanting sails and wooden hulls.

It is not easy to recover our lost position. It is not a simple matter to develop American shipping to a leading position with the present keen competition for the commerce of the world. It is, however, a necessity of our national growth, of our enlarged field of operations and of the intensity of our people which must in some way gain expression.

As a means to the full development I would suggest:

First, full tariff protection for the shipbuilding industry.

Second, subsidies, if necessary. Rebates, partial, but liberal, from duties on all importations received in American bottoms. Liberal allowance for mail carrying, and all governmental service.

Third, the building and maintenance of a navy commensurate with our seacoast, our commerce and our dignity as the leading nation on the face of the earth; a navy that will command the respect of the world for the nation, and for the flag, wherever it waves.

Fourth, a retirement of all government issues of paper money, excepting only gold certificates represented by gold held in inviolable trust for the redemption thereof, in the vaults of the treasury department.

A constitutional amendment by which gold only shall be an unlimited legal tender for all debts, public and private; by which silver shall be limited to sums not exceeding $25 as a legal tender and all paper issues, forever, shall be abridged of all legal tender powers or qualities.

It is not conducive to national pride to be forced to give exchange on London for articles we desire to import, or to

contribute to the profits of London bankers by commissions on the value of all we sell.

Our financial policy is a national disgrace. The plan suggested would restore confidence. It would remove a menace that, like Banquo's ghost, will not down. It would make New York the financial center of the world. No one questions our ability to pay in gold; but, as now conducted, we are at the mercy of any misguided politicians, temporarily placed in control by accident or neglect. This action on the legal tender question would give us stability at home and inspire confidence in the nation, and in its people, abroad, and be of greatest value in developing commercial relations with all other peoples. Yours truly,

Providence, R. I., April 21. A. H. TILLINGHAST.

Not being a marine or a shipping man I am not supposed to be possessed of expert knowledge or a sufficient familiarity with the wants of this branch of the trade to be able to instruct those engaged in it, or even make a readable and entertaining article; but from a practical business standpoint it would seem to me that the men of this trade should first get together themselves and clearly define their own position. If they can do this there is not the shadow of a doubt but other mercantile bodies, such as the National Association of Manufacturers, Manufacturers' Club of Philadelphia, and other equally important and powerful bodies, would be found willing to co-operate. They have done it in the case of the National Irrigation Association, and the results are several beneficial laws as touching our arid lands in the West. A movement of this kind, carefully and persistently engineered, would, perhaps, make the shipbuilding and ship running trades a little less arid of profits. FRANK LEAKE,

President Star & Crescent Mills Co.

Philadelphia, April 26.

There is no question as to the desirability of the protection of the shipping industry of this country, and securing again of the first place among nations, but how? Subsidy, rebate, or premium system? Our needs are imperative—let the matter be referred to those directly interested in shipping lines or to students of the situation for suggestion, and to our legislators for details and action by which the desired result can be accomplished. Yours truly,

Hopedale, Mass., April 16. E. D. BANCROFT.

PACIFIC COAST STEAMSHIP NOTES.

During the summer the Pacific Coast Steamship Co. runs excursions to southeastern Alaska, the vessels calling at Ketchikan, Wrangel, Juneau, Douglas Island, Haines, Skaguay, Killisnoo and Sitka. At Skaguay connection is made with the White Pass & Yukon railway to Dawson and other places on the Yukon river. The steamship Spokane makes six trips during the season, starting on the first from Tacoma on June 7, and on the succeeding ones at intervals of fourteen days, the round trip occupying eleven days from Tacoma. Passengers from San Francisco go on board at Tacoma, Seattle or Victoria. The Spokane was designed specially for the Alaskan tourist service, having a large observation hall where passengers can watch the scenery and yet be sheltered from the icy blasts that blow off the glaciers and snow-capped mountain ranges. The Spokane is a steel vessel, 281 ft. long, with water tight double bottom and bulkheads and a speed of 15 knots. She was built at the Union Iron Works. Only first-class round trip passengers and such freight as does not interfere with their comfort are carried.

The ordinary traffic between San Francisco and Alaskan ports is provided for by the steamers Umatilla, City of Puebla, Queen, Cottage City, Valencia and City of Seattle. The steamer Al-Ki leaves Seattle for Alaskan ports when sufficient inducements are offered.

The steamship Curacao carries the mail between San Francisco and the ports of Eusenada and San Jose del Cabo in Lower California, Mazatlan, Altata, La Paz, Santa Rosalia and Guaymas in Mexico. The trip from San Francisco to Guaymas occupies ten days.

The United States mail and Wells, Fargo & Co.'s Express on the Humboldt Bay route are carried by the steamers Pomona and Corona, one of which leaves San Francisco every three days, making the run to Eureka, Humboldt Bay, in about sixteen hours.

TRADE NOTES.

The Chicago Pneumatic Tool Co. has just issued a new complete hoist catalogue illustrating and describing their line of pneumatic motor hoists, cylinder hoists, trolleys, winding drums, foundry elevators, car jacks and jib cranes.

Edward A. Bunker, P. O. Box 1579, New York, is manufacturing the Wilford water proof cloth. This cloth is made of a twisted thread of flax and is strong, light and durable. It is in use on a number of cargo steamers on the great lakes.

The Watson-Stillman Co. of New York will on May 1 remove their offices from No. 46 Dey St., New York, to Aldene, Union county, N. J. The works are located at the junction of the Lehigh Valley, Baltimore & Ohio and the Central & New Jersey railroads.

Alfred B. Sands & Son, yacht and marine plumbers, 134 Beekman street, New York, have issued a calendar, the pictorial part of which is extremely interesting. It is a reproduction in the three-color process of two ships under full sail, and is extremely well printed.

The American Steel Casting Co. of Chester, Pa., turned out last week an immense anchor stem weighing 94,000 lbs. It required three heats to pour it and there was not a leak during the process. The stem, which will take about a fortnight to cool, will be taken from the mold and sent to the Fore River Ship & Engine Co., Quincy, Mass.

Thomas Drein & Son, Wilmington, Del., report that a good demand for metallic life boats for use on steamers and also of small size metallic life boats for tugs. A fair demand is coming in from fishing steamers for their life rafts. The company is preparing a stock of boats of all sizes for steamboat fitting-out for the spring and summer season.

The Scully Steel & Iron Co. of Chicago has just issued a fine catalogue, devoted to the metal expansion tools and machinery invented by Luther D. Loveken. The tools and machines illustrated are for the purpose of expanding and flanging pipe from the smallest size boiler pipe to the largest lap-welding pipe made, and are based upon an entirely new mechanical principle. The catalogue may be had for the asking.

Including the Cunard liner Carmania, building at Clydebank, and the two Allan steamers in the hands of Messrs. Workman, Clark & Co., Belfast, and Messrs. A. Stephen & Sons, respectively, there are at present eleven turbine steamers of large tonnage for the deep sea trade under construction in England. Messrs. W. Denny & Sons, Dumbarton, are themselves building seven of the remaining eight—one for the Larne & Straurear route, one for the Midland Railway Co., one for the Union Steamship Co., of New Zealand, and four for colonial service. The remaining one is being built by Messrs. Vickers Sons & Maxim at Barrow, and is for the Midland Railway Co. The Allan turbines, the Victorian and Virginian are to be provided with first-class refrigerating machinery to enable them to carry dairy produce.

The White Star Line intend shortly to equip their North Atlantic liners with Marconi's wireless telegraphy. A bulletin, it is stated, is also to be published on the White Star liners in the same way as on the Cunard vessels, so that very shortly there will be practically no liners on the Atlantic which cannot communicate with each other at sea.

WANTED and FOR SALE Department.

FOR SALE.

Schooner for Sale.

For Sale —Schooner Minnie Slauson. 317 gross tons. Rated A 2. For information inquire of Capt. L. Larson, 812 Huron St., Manitowoc, Wis. tf

Buckets.

For Sale.—Two clam-shell buckets (standard makes) and a number of Long patent drop bottom coal buckets. Address Box 64, Marine Review, Cleveland tf

Tug for Sale.

Tug Frank Canfield, 75 ft. long. Engine 18 x 20, boiler 6½ x 13. Address Canfield Tug Line, Manistee, Mich. Apr. 28

Diving Outfit For Sale.

Three iron bound cases containing a complete diving outfit for $175 cash. The suit and equipment is in first-class working order with 70 ft. new air hose. Bart E. Linehan, Dubuque, Ia. May 5

Steamer for Sale at Cost, $13,500.

The old Anchor Line twin-screw steamer Gordon Campbell. Two decks, gangways, hoisting machinery, etc. Suited to carrying coal, lumber, ties, package freight, etc. Spent $3,500 in repairs this year. Other business requires my undivided attention and I will sell for cost to me. W. F. Carroll, 1011 Ashland block, Chicago. tf

Steam Yacht for Sale.

Steam Yacht Vita.—Length 100 ft, beam 18 ft. Iron frame. Fully equipped. Can be seen at her anchorage at Detroit. Inquire of J. M. Kennedy, 915 Union Trust Bldg., Detroit, Mich. May 12

FOR SALE.

Yacht for Sale.

New beautiful 100-ft. steam yacht, fully equipped. Owner physically unable to use yacht. Will sell for any reasonable offer. Yacht can be seen in Detroit. Address M. J. Steffens, 57 East Twenty-second st., Chicago. tf

Two Steamers for Sale.

The Union Transit Co. in closing out its business offers the steamers John M. Nicol and Eber Ward for sale.

The steamer John M. Nicol is of the following dimensions: length 263 ft., beam 41 ft., depth 26 ft. Triple expansion engines with 900 indicated H.P. Steel boiler-house enclosing two Scotch boilers with steam pressure of 150 lbs. About $30,000 laid out for repairs on this steamer in the past year.

Steamer Eber Ward.—Length 213 ft., beam 37 ft., depth 23 ft. Engines F.& A. compound with an indicated H.P. of 600. One Scotch boiler with steam pressure of 110 lbs.

For further information apply to H. C. French, 900 Ellicott Square, Buffalo, N.Y. May 12

Freight and Passenger Steamer.

For Sale.—Up-to-date, complete, speedy excursion freight and passenger steamer. Accommodate 400 to 500. Address Indiana Trans. Co., 2 Rush St., Chicago. May 5

Sand and Gravel Outfit.

For Sale Cheap.—Complete sand and gravel outfit. Most economical plant in North America. For particulars address Osborn & Co., Duluth, Minn. May 5

FOR SALE.

Steam Yacht Catherine.

For Sale.—Length 78 ft, beam 18 ft., triple expansion engines, water tube boiler, allowed 200 lbs.; electric light, search light, mahogany deck house 9 by 16, power launch, complete outfit, all in first-class condition. One of the best family cruising yachts on the Lakes. Inquire Wickes Bros., Saginaw, Mich, tf

Steamer C. W. Liken.

For Sale Cheap.—79 ft. long over all, 18 ft. beam. Engine 10 square. Rebuilt this winter. Would make good fish tug or small passenger tug. For further particulars address A. Wheeler, Bay City, Mich. May 19

WANTED.

Passenger Steamer Wanted.

Passenger steamer to carry 700 or more passengers from Milwaukee to Whitefish Bay Resort, Wisconsin Exclusive landing rights given for pier. Address H. Konopka, Whitefish Bay, Wis. May 5

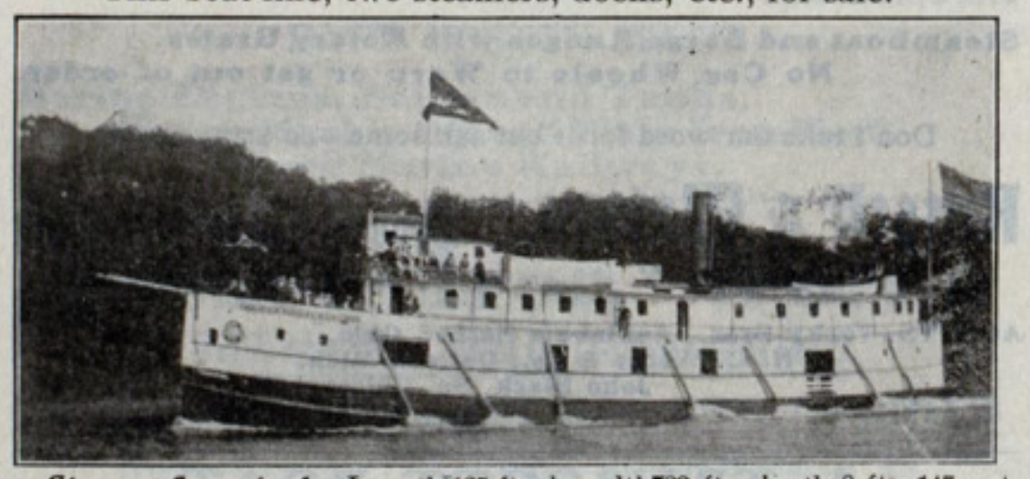
Mud Scows Wanted.

Wanted—Two mud scows, capacity one to two hundred cubic yards. State price and particulars. Address Box 65, Marine Review, Cleveland. May 26

Sealed proposals will be received at the office of the Lighthouse Engineer, Milwaukee, Wisconsin, until 3 o'clock p. m. June 1, 1904, and then opened, for a foundation crib and concrete pier with light tower and dwelling for Racine Reef, Lake Michigan, Wisconsin, in accordance with specifications, copies of which, with blank proposals and other information, may be had upon application to J. G. WARREN, Major, Corps of Engineers, U. S. A., Engineer. May 19

Chicago, Saugatuck & Douglas Trans. Co.

This boat line, two steamers, docks, etc., for sale.



Steamer Saugatuck—Length 125 ft., breadth 22 ft., depth 8 ft., 147 net tons. Licensed to carry 84 regular, 225 excursion passengers.

Steamer Chas. McVea—Length 135 ft., breadth 24 ft., depth 10 ft., 263 net tons. Licensed to carry 91 regular, 300 excursion passengers.

For full particulars apply to Griffin & Henry, Saugatuck, Mich. May 5

FOR SALE—This Fast Express, Seaworthy Propellor, (built 1902) wood hull, 4 water tight compartments, length 138 ft. by 28 ft. by 11 ft. 6 in., draught 8 ft. aft, 6 ft. forward; can carry 200 tons on 8 ft. maximum draught, F. and A. compound engines, cylinders 12 by 28 in. and 20 in. stroke. Has two Almy W. T. boilers of 450 H. P.; complete electric plant and searchlight. Bunker capacity 35 tons; consumes 5 tons in 24 hours. Speed, natural draft 13 miles, forced draft 14½ miles an hour. Allowed 400 day passengers. Price $45,000. Address Wm. M. Talbott, 1531 N. Broadway, Baltimore, Md. May 5

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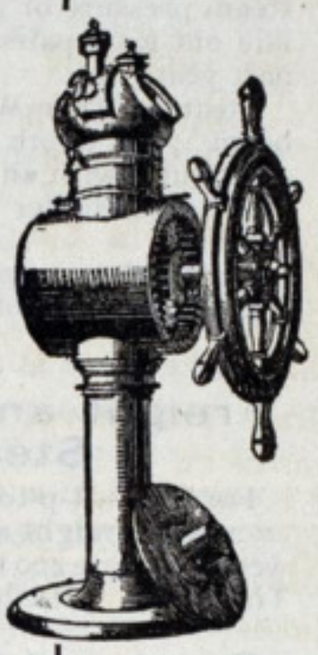

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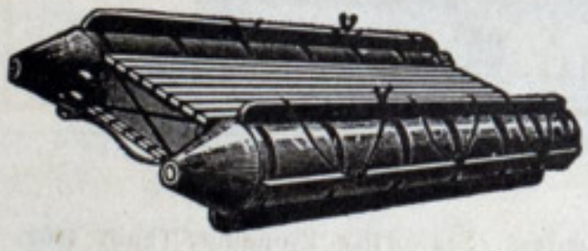

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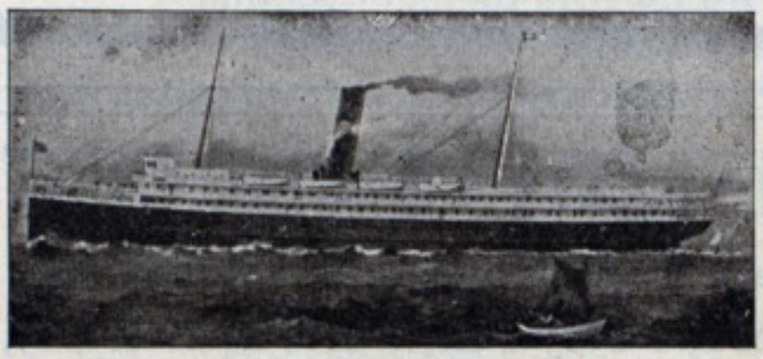

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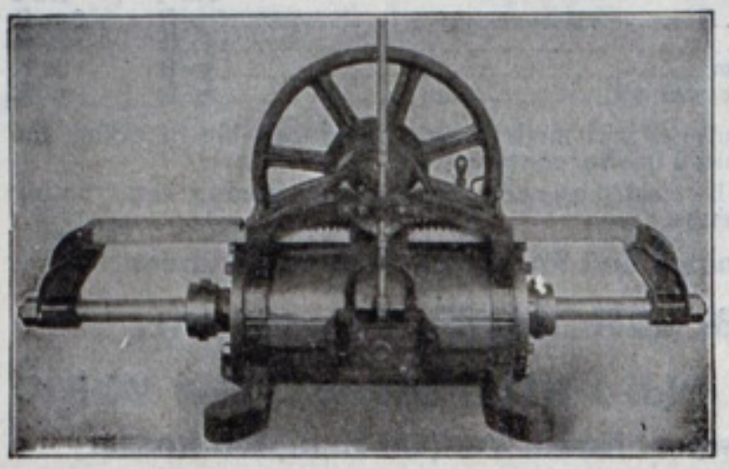

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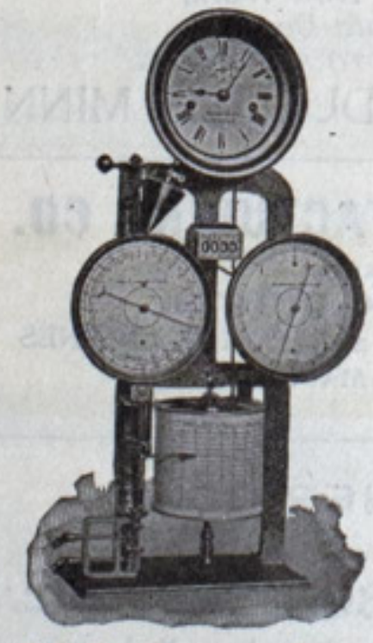

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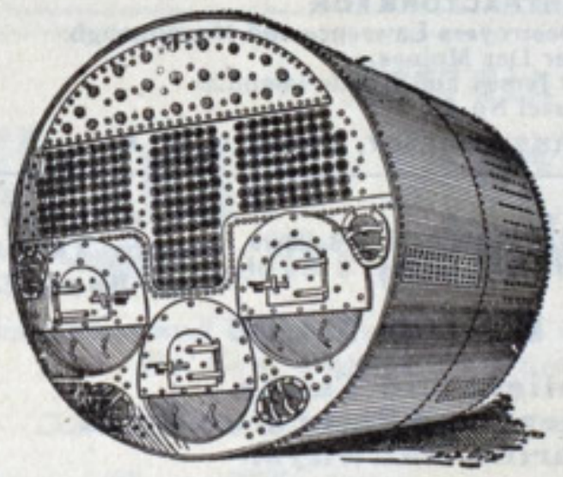

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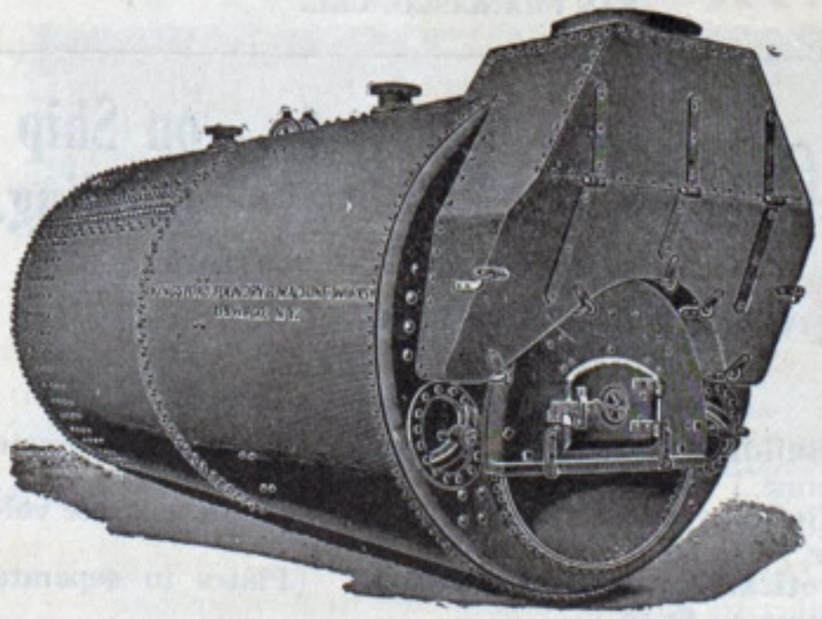

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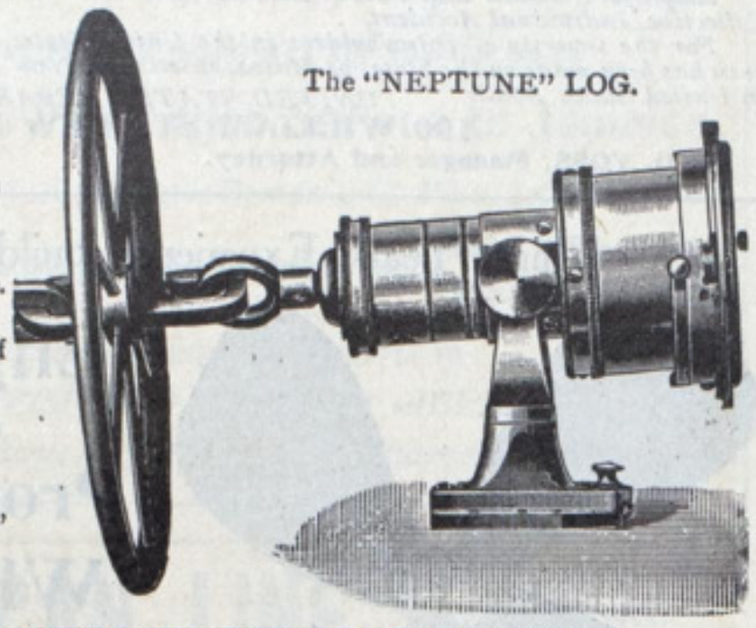

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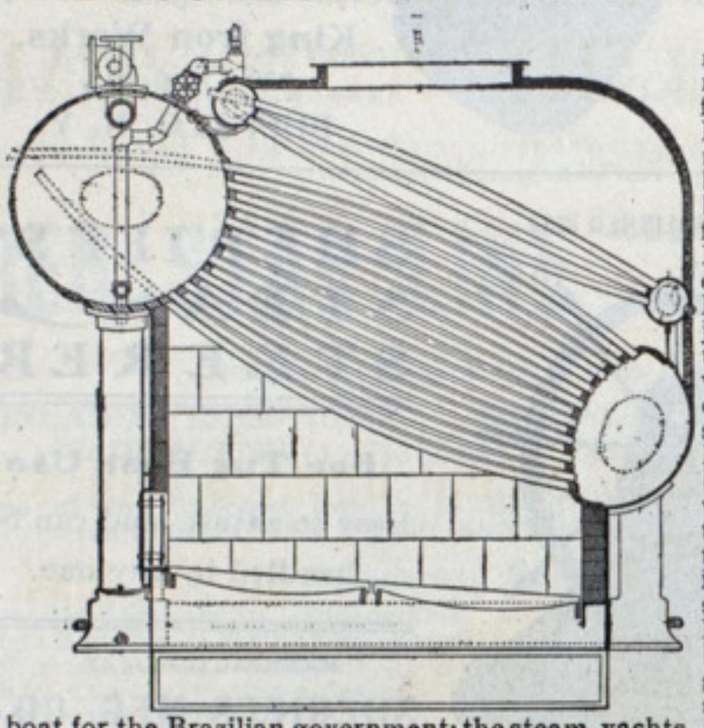

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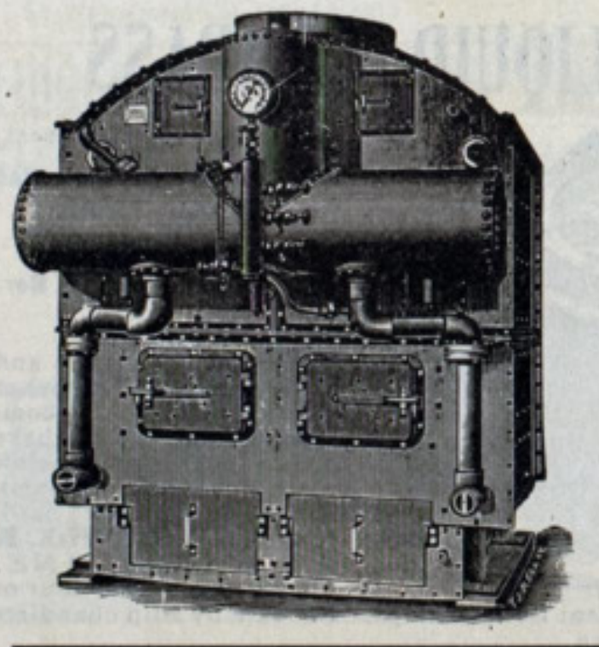

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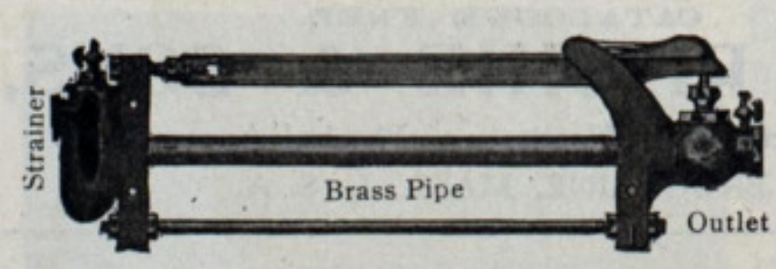

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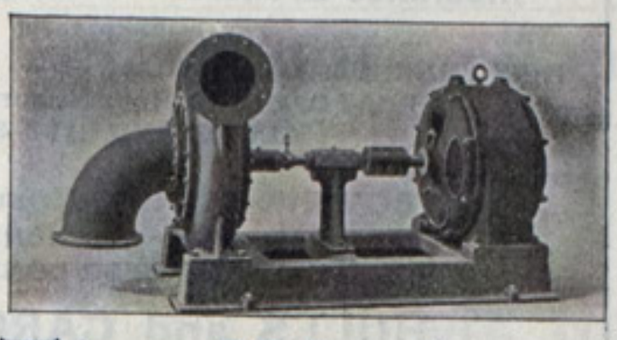

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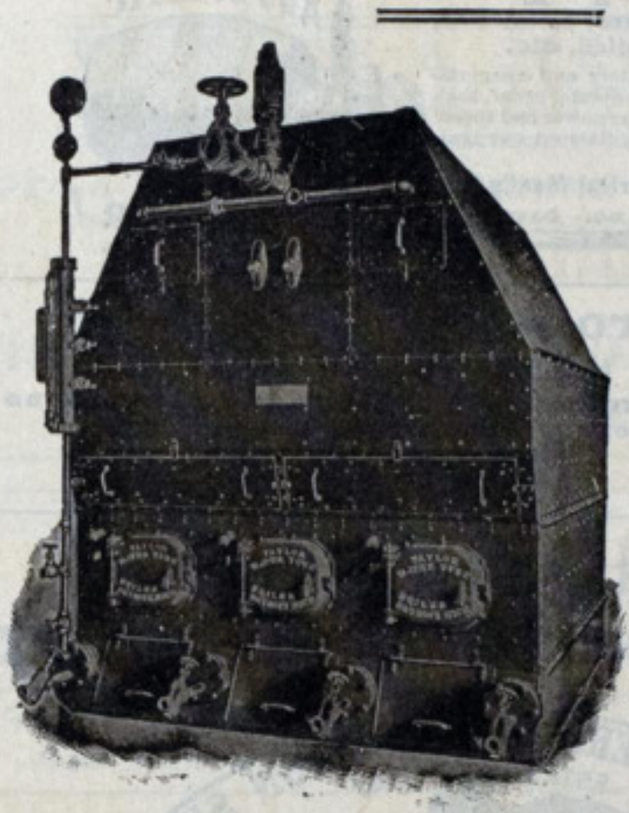

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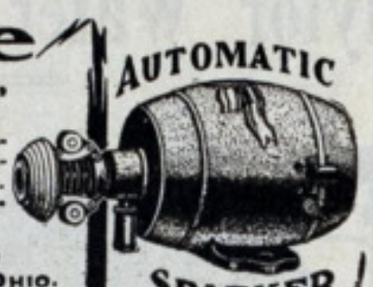

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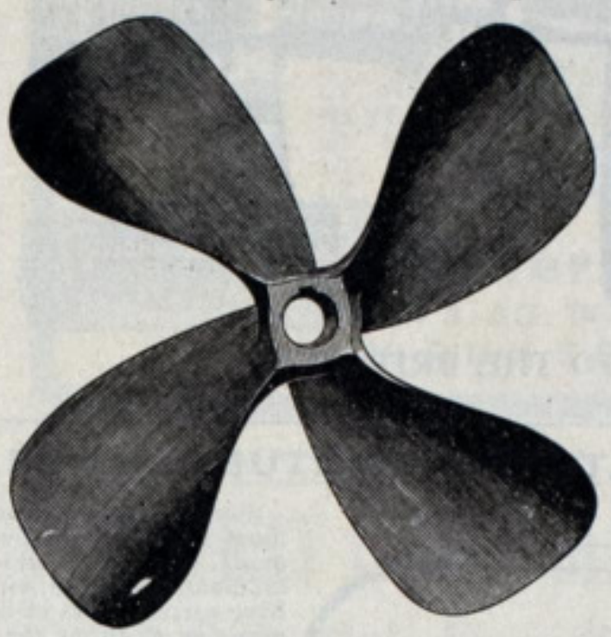

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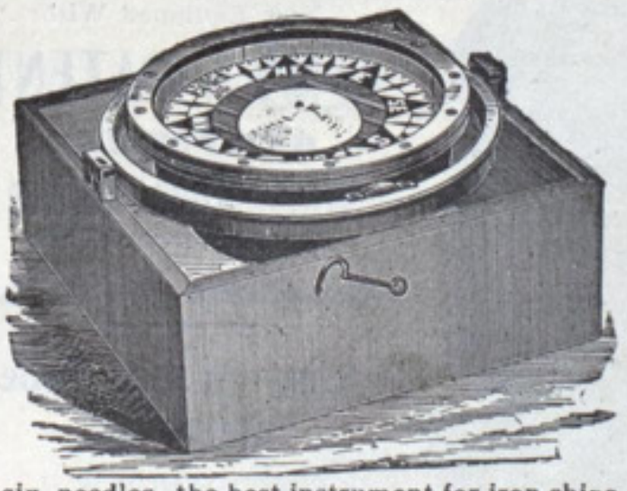

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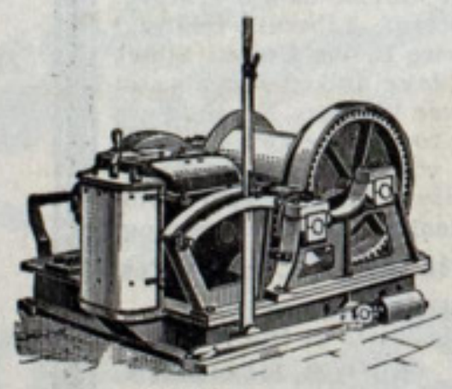

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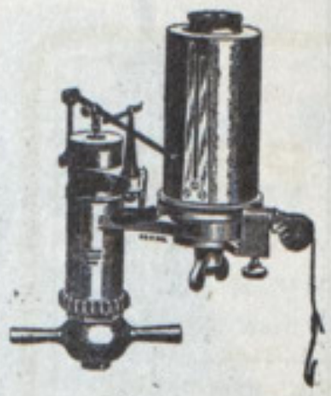

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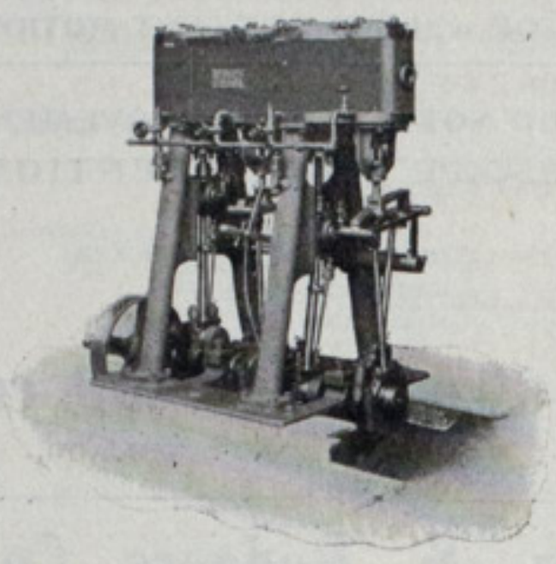

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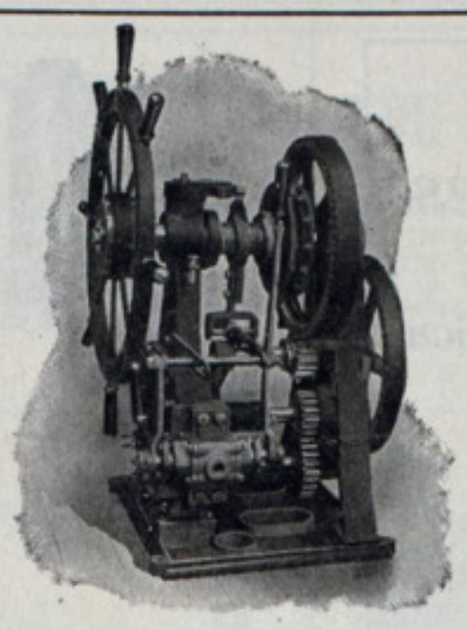

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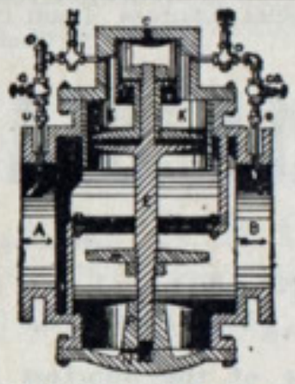

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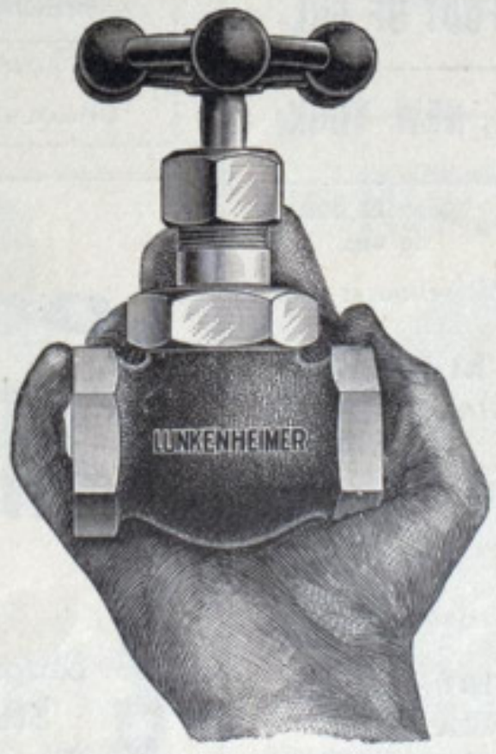

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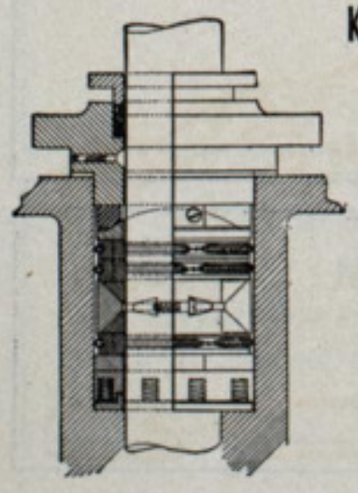

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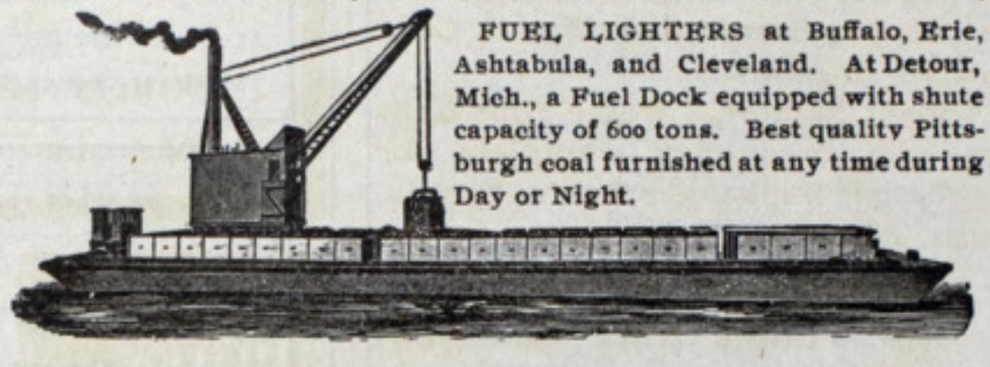

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INDICATORS FOR STEAM ENGINES.

American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.

INJECTORS.

American Injector Co.....Detroit.
Crane Co.....Chicago.
Jenkins Bros. .....New York.
Lunkenheimer Co.....Cincinnati.
Penberthy Injector Co.....Detroit, Mich.

INSURANCE, MARINE.

Elphicke, C. W. & Co.....Chicago.
Fleming & Co., P. H.....Chicago.
Frankfort Marine, A. & P. G. Ins. Co....New York.
Gilchrist & Co., C. P.....Cleveland.
Hawgood & Co., W. A.....Cleveland.
Helm & Co., D. T.....Duluth.
Hutchinson & Co.....Cleveland.
McCarthy, T. R.....Montreal.

INSURANCE, MARINE.—Continued.

McCurdy, Geo. L.....Chicago.
Mitchell & Co.....Cleveland.
Parker Bros. Co., Ltd.....Detroit.
Peck, Chas. E. & W. F.....New York and Chicago.
Prindiville & Co.....Chicago.
Richardson, W. C.....Cleveland.
Sullivan, D. & Co.....Chicago.
Voss, F. D.....New York.
Weeks, F. H.....New York.

IRON ORE AND PIG IRON.

Bourne-Fuller Co.....Cleveland.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland

LAUNCHES—STEAM, NAPHTHA, ELECTRIC.

Marine Construction & D. D. Co.....
.....Mariner's Harbor, S. I., N. Y.
Truscott Boat Mfg. Co.....St. Joseph, Mich.
Willard, Chas. P.....Chicago.

LIFE PRESERVERS, LIFE BOATS, BUOYS.

Armstrong Cork Co. .....Pittsburg.
Carley Life Float Co.....New York.
Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Long Island City, N. Y.
Marine Construction & Dry Dock Co.....
.....Mariner's Harbor, S. I., N. Y.

LIGHTS, SIDE AND SIGNAL.

Russell & Watson .....Buffalo.

LOGS.

Nicholson Ship Log Co.....Cleveland.
Walker & Sons, Thomas.....Birmingham, Eng.
Also Ship Chandlers.

LUBRICATING GRAPHITE.

Dixon Crucible Co., Joseph.....Jersey City, N. J.

LUBRICATORS.

Crane Co. .....Chicago.
Lunkenheimer Co. .....Cincinnati.

LUMBER.

Martin-Barriss Co .....Cleveland.
Shurick, F. S. .....New York.

MACHINISTS.

Chase Machine Co.....Cleveland.
Gogebic Steam Boiler Works .....Duluth, Minn.
Hickler Bros.... ..... Sault Ste. Marie, Mich.
Lockwood Mfg. Co.....East Boston, Mass.
Macbeth Iron Co.....Cleveland.
Mooers & Co., H.....Milwaukee.
Union Machine & Boiler Co.....Cleveland.

MACHINE TOOLS (WOOD WORKING).

Atlantic Works, Inc.....Philadelphia.

MARINE RAILWAYS.

Hickler Bros..... Sault Ste. Marie, Mich.

MARINE RAILWAYS, BUILDERS OF.

Crandall & Son, H. I.....East Boston, Mass.

MATTRESSES, CUSHIONS, BEDDING.

Fogg, M. W.....New York.
Meckes John..... .....Cleveland
Siegel Cooper Co.....New York.
Sterling & Welch Co. ..... Cleveland.
Williams & Rodgers Co., ...Cleveland.

MECHANICAL DRAFT FOR BOILERS.

American Ship Building Co.....Cleveland.
Detroit Ship Building Co.....Detroit.
Great Lakes Engineering Works. ..... Detroit.
Sturtevant, B. F. Co.....Boston.

METALLIC PACKING.

Katzenstein, L. & Co.....New York.
U. S. Metallic Packing Co.....Philadelphia

METAL POLISH.

Bertram's Oil Polish Co.....Boston.

MOTORS, GENERATORS—ELECTRIC.

General Electric Co.....Schenectady, N. Y.
Bayley & Sons Co., Wm. ..... Milwaukee, Wis.
Sturtevant, B. F. Co.....Boston.
Westinghouse Electric & Mfg. Co....Pittsburg, Pa.

NAUTICAL INSTRUMENTS.

Ritchie, E. S. & Sons..... .....Brookline, Mass

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NAVAL ARCHITECTS.

Hynd, Alexander .....Cleveland.
Kidd, Joseph .....Duluth, Minn.
Lovejoy, H. O. .....Buffalo.
Matteson & Drake .....Philadelphia.
Mosher, Chas. D.....New York.
Nacey, James .....Cleveland.
Rice, Henry .....Buffalo.
Sadler, Perkins & Field.....New York.
Steel, Adam .....Cleveland.
Wood, W. J.....Chicago.

OAKUM.

DeGrauw, Aymar & Co.....New York.
Stratford Oakum Co .....Jersey City, N. J.

OIL FOR PAINTING.

Sipe & Co., James B.....Allegheny, Pa

OILS AND LUBRICANTS.

Dixon Crucible Co., Joseph.....Jersey City, N. J.
Standard Oil Co.....Cleveland

PACKING.

American Steam Packing Co.....Boston.
Crane Co. .....Chicago.
Jenkins Bros. .....New York.
Katzenstein, L. & Co.....New York.
New York Belting & Packing Co.....New York.
United States Metallic Packing Co....Philadelphia

PAINTS.

Baker, Howard H. & Co.....Buffalo.
Detroit Varnish Co.....Detroit.
Detroit White Lead Works.....Detroit.
Forest City Paint and Varnish Co .....Cleveland.
New Jersey Zinc Co.....New York.
Sipe & Co., James B.....Allegheny, Pa.
Upson-Walton Co. .....Cleveland

PATENT ATTORNEYS.

Thurston & Bates .....Cleveland

PATTERN SHOP MACHINERY.

Atlantic Works, Inc.....Philadelphia

PILE DRIVING AND SUBMARINE WORK.

Buffalo Dredging Co .....Buffalo.
Chicago & Gt. Lakes Dredge & Dock Co...Chicago.
Dunbar & Sullivan Dredging Co.....Buffalo.
Fitz-Simon & Connell Co.....Chicago.
Hickler Bros..... Sault Ste. Marie, Mich.
Parker Bros. Co., Ltd.....Detroit.
Smith Co., L. P. & J. A.....Cleveland.
Starke Dredge & Dock Co., C. H.....Milwaukee.

PIPE, WROUGHT IRON.

Bourne-Fuller Co.....Cleveland.
Crane Co. .....Chicago.
Macbeth Iron Co. .....Cleveland

PLANING MILL MACHINERY.

Atlantic Works, Inc.....Philadelphia.

PLATES—SHIP, STRUCTURAL, ETC.

Bourne-Fuller Co. .....Cleveland
Otis Steel Co .....Cleveland.

PNEUMATIC TOOLS.

Allen, John F.....New York.

POLISH FOR METALS.

Bertram's Oil Polish Co.....Boston.

PRESSURE REGULATORS.

Kieley & Mueller .....New York.
Ross Valve Co.....Troy, N. Y.

PROPELLER WHEELS.

American Ship Building Co.....Cleveland.
Atlantic Works .....East Boston, Mass.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Ship Building Co.....Detroit.
Fore River Ship & Engine Co.....Quincy, Mass.
Great Lakes Engineering Works.....Detroit.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Lockwood Mfg. Co.....East Boston, Mass.
Macbeth Iron Co.....Cleveland.
Milwaukee Dry Dock Co.....Milwaukee.
Newport News Ship Building Co.Newport News, Va.
Phosphor Bronze Smelting Co., Ltd.....Philadelphia.
Risdon Iron Works .....San Francisco.
Roelker, H. B.....New York.
Sheriffs Mfg. Co.....Milwaukee.
Superior Shipbuilding Co.....Superior, Wis.
Thropp & Sons Co., J. E.....Trenton, N. J.
Trout, H. G.....Buffalo.
United States Ship Building Co.....New York.

PROJECTORS, ELECTRIC.

General Electric Co.....Schenectady, N. Y.
Westinghouse Electric & Mfg. Co....Pittsburg, Pa.

PUMPS FOR VARIOUS PURPOSES.

Blake, Geo. F., Mfg. Co.....New York.
Great Lakes Engineering Works.....Detroit.
Kingsford Foundry & Machine Wks..Oswego, N. Y.
Temple Pump Co..... ..Chicago.

PUNCHES, RIVETERS, SHEARS.

Allen, John F.....New York.

RANGES.

Russell & Watson .....Buffalo.

REFRIGERATING APPARATUS.

Great Lakes Engineering Works.....Detroit.
Roelker, H. B.....New York.

REGISTER FOR CLASSIFICATION OF VESSELS.

Great Lakes Register .....Cleveland.
Record of American & Foreign Shipping..New York.

REPAIRS—ENGINE AND BOILER.

(See also Boiler Manufacturers and Engine Builders.)

Gogebic Steam Boiler Works..... Duluth, Minn.
Marine Iron Co..... Duluth, Minn.
Forest City Boiler Co..... Cleveland.

RIVETING MACHINES.

Allen, John F.....New York.

RIVETS, STEEL, FOR SHIPS AND BOILERS.

Bourne-Fuller Co.....Cleveland.

SAFETY VALVES.

American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crane Co. .....Chicago.
Hayden Mfg. Co., N. L.....Columbus, O.
Lunkenheimer Co. .....Cincinnati.

SAIL MAKERS.

Baker, Howard H. & Co.....Buffalo.
Upson-Walton Co.....Cleveland.
Wilson & Silsby .....Boston.

SALVAGE COMPANIES.

See Wrecking Companies.

SEARCH LIGHTS.

General Electric Co.....Schenectady, N. Y.
Westinghouse Electric & Mfg. Co....Pittsburg, Pa.

SHEARS.

See Punches, Rivets, and Shears.

SHIP AND BOILER PLATES AND SHAPES.

Bourne-Fuller Co.....Cleveland.
Otis Steel Co. ..... Cleveland.

SHIP BUILDERS.

American Ship Building Co.....Cleveland.
Atlantic Works .....East Boston, Mass.
Buffalo Dry Dock Co.....Buffalo.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Chicago Ship Building Co.....Chicago.
Detroit Ship Building Co.....Detroit.
Fore River Ship & Engine Co.....Quincy, Mass.
Great Lakes Engineering Works.....Detroit.
Jenks Ship Building Co.....Port Huron, Mich.
Lockwood Mfg. Co.....East Boston, Mass.
Manitowoc Dry Dock Co.....Manitowoc, Wis.
Milwaukee Dry Dock Co.....Milwaukee.
Newport News Ship Building Co.Newport News, Va.
Risdon Iron Works .....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Shipowner's Dry Dock Co.....Chicago.
Smith & Son, Abram .....Algonac, Mich.
United States Ship Building Co.....New York.
Willard, Chas. P. & Co.....Chicago.

SHIP CHANDLERS.

Baker, Howard H. & Co.....Buffalo.
Marine Mfg. & Supply Co..... New York.
Upson-Walton Co.....Cleveland.

SHIP LANTERNS AND LAMPS.

Russell & Watson .....Buffalo.

SHIP TIMBER.

Martin-Barriss Co. .....Cleveland.
Shurick, F. S.....New York.

SMOOTH-ON COMPOUND, FOR REPAIRS.

Smooth-On Mfg. Co.....Jersey City, N. J.

STAYBOLTS, IRON OR STEEL, HOLLOW, OR, SOLID.

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

STEAM VESSELS FOR SALE.

Elwell, Jas. W. & Co.....New York.
Gilchrist & Co., C. P.....Cleveland.
Holmes, Samuel .....New York.
McCarthy, T. R.....Montreal, Can.
Weeks, F. H.....New York.

STEAMSHIP LINES, PASS. AND FREIGHT.

American Line.....New York.
International Mercantile Marine Co....Philadelphia.
Red Star Line .....New York.
United Fruit Co ..... Boston.

STEEL CASTINGS.

Macbeth Iron Co.....Cleveland.
Otis Steel Co. ..... Cleveland.
Seaboard Steel Casting Co.....Chester, Pa.

STEERING APPARATUS.

American Ship Building Co.....Cleveland.
Chase Machine Co.....Cleveland.
Dake Engine Co.....Grand Haven, Mich.
Detroit Ship Building Co.....Detroit.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Marine Mfg. & Supply Co.....Cleveland.
Moulton Steering Engine Co.....New York.
Pawling & Harnischfeger .....Milwaukee.
Sheriffs Mfg. Co. .....Milwaukee.

SUBMARINE DIVING APPARATUS.

Morse & Son, A. J.....Boston.
Schrader's Son, A.....New York.

SURVEYORS, MARINE.

Gaskin, Edward .....Buffalo.
Hynd, Alexander .....Cleveland.
Lovejoy, H. O. .....Buffalo.
Matteson & Drake .....Philadelphia.
Parker Bros. Co., Ltd. ..... Detroit.
Nacey, James .....Cleveland.
Rice, Henry .....Buffalo.
Steel, Adam .....Cleveland.
Wood, W. J.....Chicago.

TESTS OF MATERIALS.

Hunt, Robert W. & Co.....Chicago.
Pittsburg Testing Laboratory Ltd.....Pittsburg.

TILING, INTERLOCKING RUBBER.

New York Belting & Packing Co.....New York.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.

Allen, John F. .....New York.
Watson-Stillman Co. .....New York.

TOOLS, WOOD WORKING.

Atlantic Works, Inc.....Philadelphia.

TOWING MACHINES.

American Ship Windlass Co.....Providence, R. I.
Chase Machine Co.....Cleveland.

TOWING COMPANIES.

Donnelly Salvage & Wrecking Co....Kingston, Ont.
Midland Towing & Wrecking Co., Ltd.Midland, Ont.

TRAPS, STEAM.

Kieley & Mueller .....New York.
Lunkenheimer Co. .....Cincinnati.
Sturtevant Co., B. F., Jamaica Plain.....Boston.

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TRUCKS.

Boston & Lockport Block Co.....Boston.

TUBING, SEAMLESS.

Shelby Steel Tube Co.....Pittsburg, Pa.

VALVES, STEAM SPECIALTIES, ETC.

American Steam Gauge Co.....Boston.
Ashton Valve Co .....Boston.
Crane Co. .....Chicago.
Jenkins Bros. .....New York.
Kieley & Mueller .....New York.
Lunkenheimer Co. .....Cincinnati.
Ross Valve Co. .....Troy, N. Y.

VALVES FOR WATER AND GAS.

Ross Valve Co.....Troy, N. Y.

VARNISHES.

Detroit Varnish Co .....Detroit.
Detroit White Lead Works.....Detroit.
Forest City Paint & Varnish Co.. .. ..Cleveland
New Jersey Zinc Co.....New York.
Also Ship Chandlers.

VENTILATING APPARATUS FOR SHIPS.

Bayley & Sons Co. Wm. .... Milwaukee, Wis.
Sturtevant, B. F. Co.....Boston.

VESSEL AND FREIGHT AGENTS.

Boland, John J.....Buffalo.
Brown & Co. .....Buffalo.
Elwell, Jas. W. & Co.....New York.
Elphicke, C. W. & Co.....Chicago.
Fleming & Co., P. H.....Chicago.
Gilchrist & Co., C. P.....Cleveland.
Hall & Root .....Buffalo.
Helm & Co., D. T.....Duluth.
Hawgood & Co., W. A.....Cleveland
Holmes, Samuel .....New York.
Hutchinson & Co. .....Cleveland.
McCarthy, T. R.....Montreal.
Mitchell & Co. .....Cleveland.
Parker Bros. Co., Ltd. .... Detroit.
Prindiville & Co. .....Chicago.
Richardson, W. C. .....Cleveland.
Sullivan, D. & Co.....Chicago.
Weeks F. H.....New York.

WATER GAUGES.

Bonner & Co., Wm. T ....Boston
Lunkenheimer Co.....Cincinnati, O.

VESSEL FURNISHINGS.

Meckes, John ....Cleveland
Siegel Cooper Co.....New York.
Sterling & Welch Co. ....Cleveland
Williams & Rodgers Co., ...Cleveland.

WIRE ROPE AND WIRE ROPE FITTINGS.

Baker, H. H. & Co.....Buffalo.
DeGrauw, Aymar & Co.....New York.
Upson-Walton Co. .....Cleveland.

WHISTLES, STEAM.

American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Lunkenheimer Co. .....Cincinnati.

WINDLASSES.

American Ship Windlass Co.....Providence, R. I.
American Ship Building Co.....Cleveland.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Marine Mfg. & Supply Co ....New York.

WINCHES.

American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.

WOOD WORKING MACHINERY.

Atlantic Works, Inc.....Philadelphia.

WRECKING AND SALVAGE COMPANIES.

Donnelly Salvage & Wrecking Co..Kingston, Ont.
Midland Towing & Wrecking Co., Ltd.Midland, Ont.
Parker Bros Co., Ltd.....Detroit.

YACHT AND BOAT BUILDERS.

Drein, Thos. & Son.....Wilmington, Del.
Lane & DeGroot.....Long Island City, N. Y.
Marine Construction & Dry Dock Co....New York.
Truscott Boat Mfg. Co.....St. Joseph, Mich.
Willard, Chas. P. & Co.....Chicago.

YAWLS.

Drein, Thos. & Son.....Wilmington, Del.
Lane & DeGroot.....Long Island City, N. Y.

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L. P. & J. A. SMITH
COMPANY.

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Dredging, Harbor Work, Pile Driving, Breakwaters,
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Offices: Williamson Bldg., Cleveland, O.

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Will contract to remove ROCK or EARTH on the Great Lakes to 40 ft. depth.
To remove ROCK on Atlantic Coast to 40 ft. depth.
THAT'S ALL.

We SOMETIMES rent plant to responsible parties at OUR terms.

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Erin Go Braugh.
Drill Boats.
Geo. A. Howells and another, both Steel.
Tugs.
Shaughraun, Steel.
Phil Sheridan, Steel.
Spalpeen, Steel.
Paddy Miles, Steel.
Shaun Rhue, Steel.
Derrick.
Faugh a Ballaugh.

Scows.
Monroe Doctrine, 600 yds., Steel.
Protective Policy, 500 yds., Steel.
Reciprocity, 600 yds., Steel.
Cuba Libre. 250 yds., Steel.
Gold Standard, 250 yds., Steel.
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No. 6, 600
No. 7, 600
No. 8, 600
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McMyler derrick handling 10 tons at 75 ft. radius.
Small Scows.

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Capacity, 1,000 tons.
Draft, 7½ ft. forward, 13½ ft. aft.
Length on keel blocks, 180 ft.; over all, 190 ft.

Machine Shop, Foundry and Steam Forge.
Dredges, Drill Boats and Derrick Scows.

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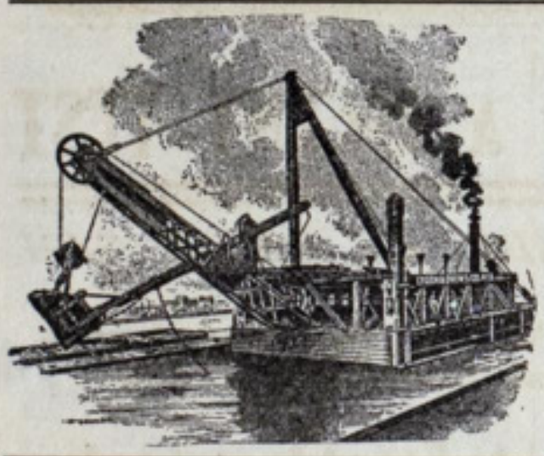

CHICAGO & GREAT LAKES
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OWNS AND OPERATES THE PLANTS OF THE FORMER COMPANIES:
LYDON & DREWS CO., HAUSLER & LUTZ CO.,
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Eastward.	Arrive from West	Depart East.
No. 18, Southwestern Lim	.....	*1:50am
No. 22, Lake Shore Lim...	*2:12am	*2:20am
No. 20, Chi & Cleve Ex....	*7:20am	.....
No. 28, N Y & Bost Ex....	*7:40am	*8:00am
No. 40, Toledo & Buff Ac.	†10:00am	†10:40am
No. 32, Fast Mail	*11:25am	*11:30am
No. 48, Ac via Sandusky..	†1:40pm	.....
No. 44, Cleve. & N. Y Sp.	.....	*3:00pm
No. 46, Southwestern Ex.	.....	*3:10pm
No. 116, Conneaut Accom	.....	†4:30pm
No. 6, Lim Fast Mail....	*5:40pm	*5:45pm
No. 26, 20th Cent Lim.....	*7:40pm	*7:43pm
No. 10, C., N Y & B Sp....	*7:30pm	*7:50pm
No. 16, New Eng Ex.....	*10:30pm	*10:35pm
No. 2, Day Express.....	†9:10pm	†9.25pm
No. 126, Norwalk Accom.	†8:10am	.....

Westward.	Arrive from East.	Depart West.
No. 11, Southwestern Lim	*3:25am	.....
No. 7, Day Express.....	.....	†6:00am
No. 15, Bost & Chi Sp.....	*3:05am	*3:15am
No. 19, Lake Shore Lim..	*7:05am	*7:15am
No. 23, Western Express.	*10:30am	*10:35am
No. 29, Southwestern Sp.	‡11:10am	.....
No. 33, Southwestern Ex	*12:25pm	.....
No. 133, Cleve & Det Ex..	.....	*12:45pm
No. 47, Accomodation.....	†11.00am	†3:00pm
No. 141, Sandusky Accom.	.....	†3:10pm
No. 43, Fast Mail	*4:35pm	*4:40pm
No. 127, Norwalk Accom..	.....	†5:10pm
No. 37, Pacific Express...	*6:50pm	*7:20pm
No. 3, Fast Mail Lim.....	*10:50pm	*10:55pm
No. 115, Conneaut Accom.	*8:30am	.....

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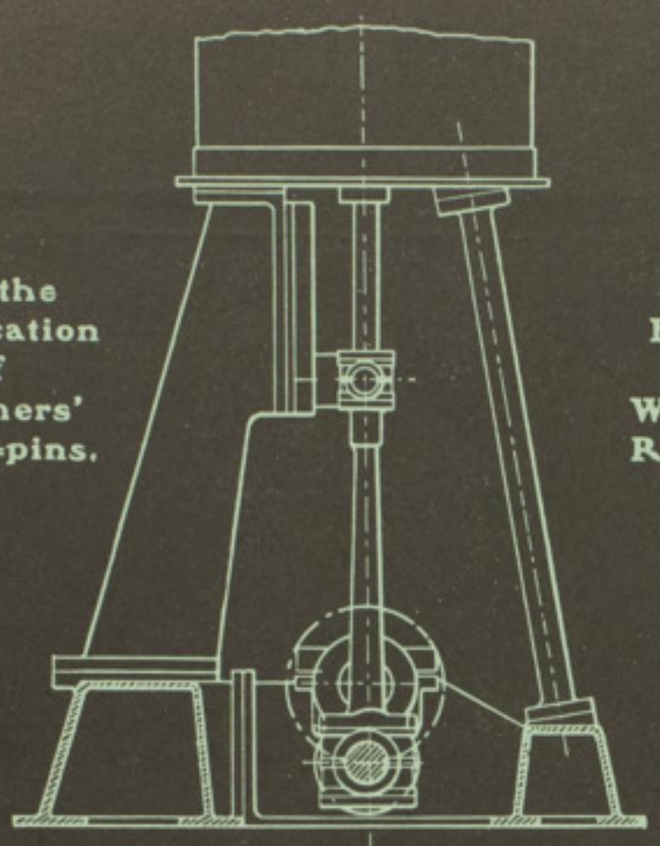

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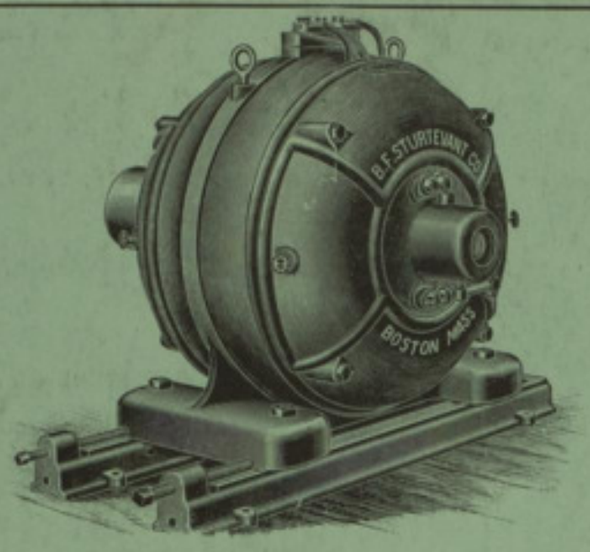

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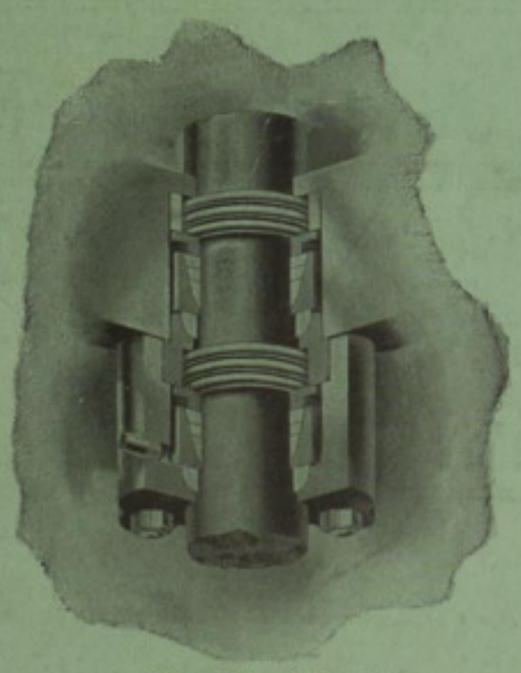

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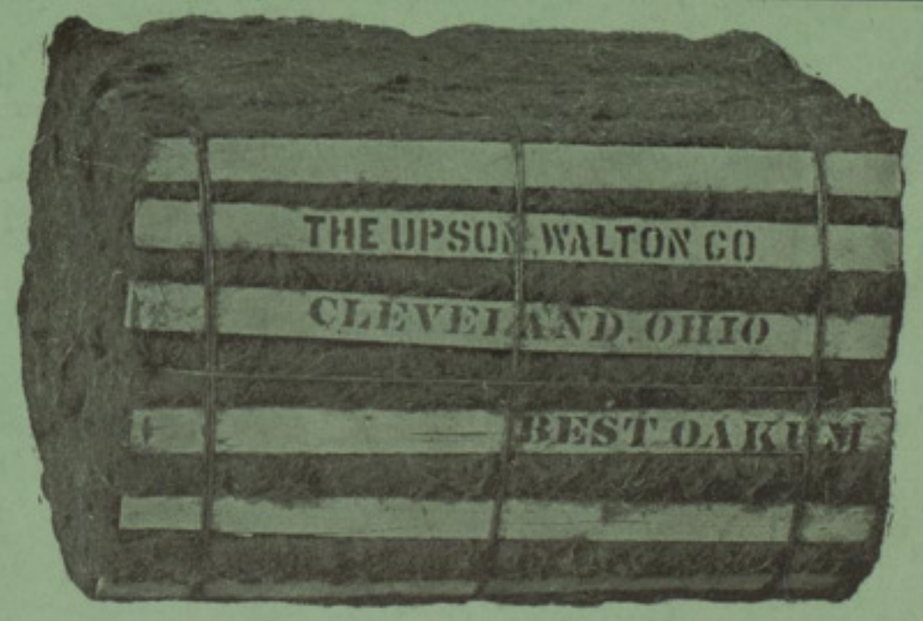

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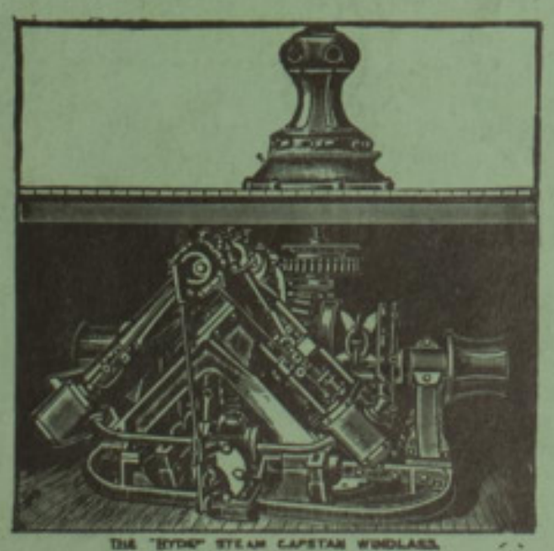

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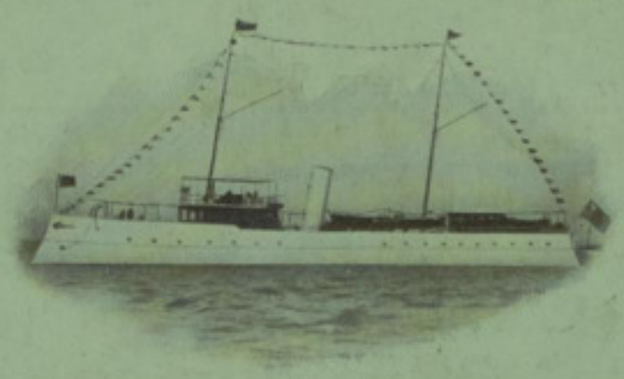

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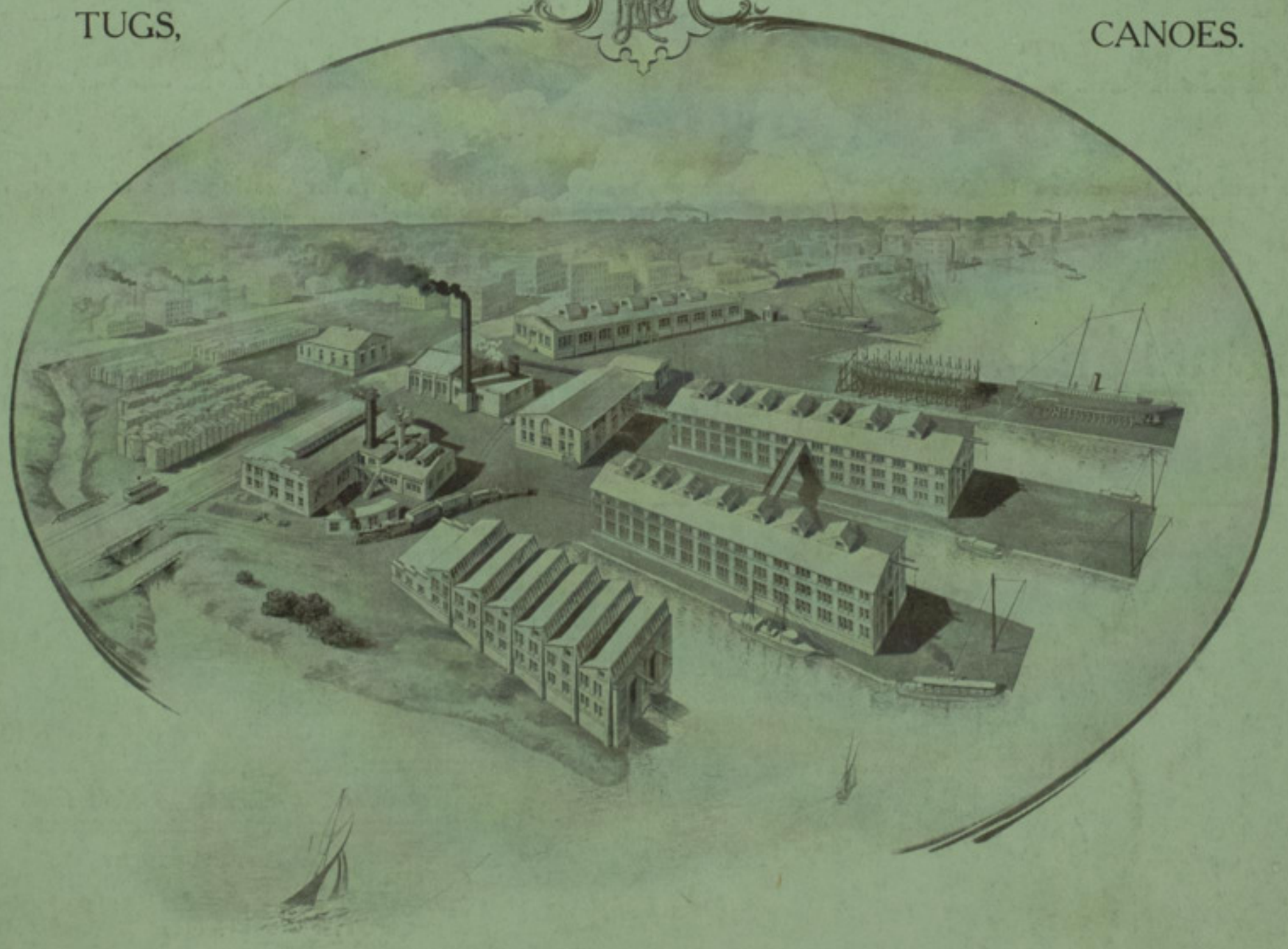

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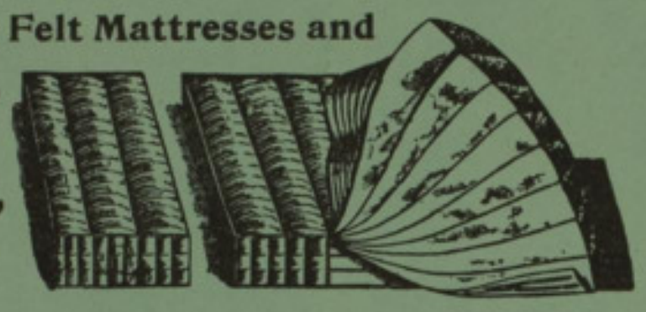

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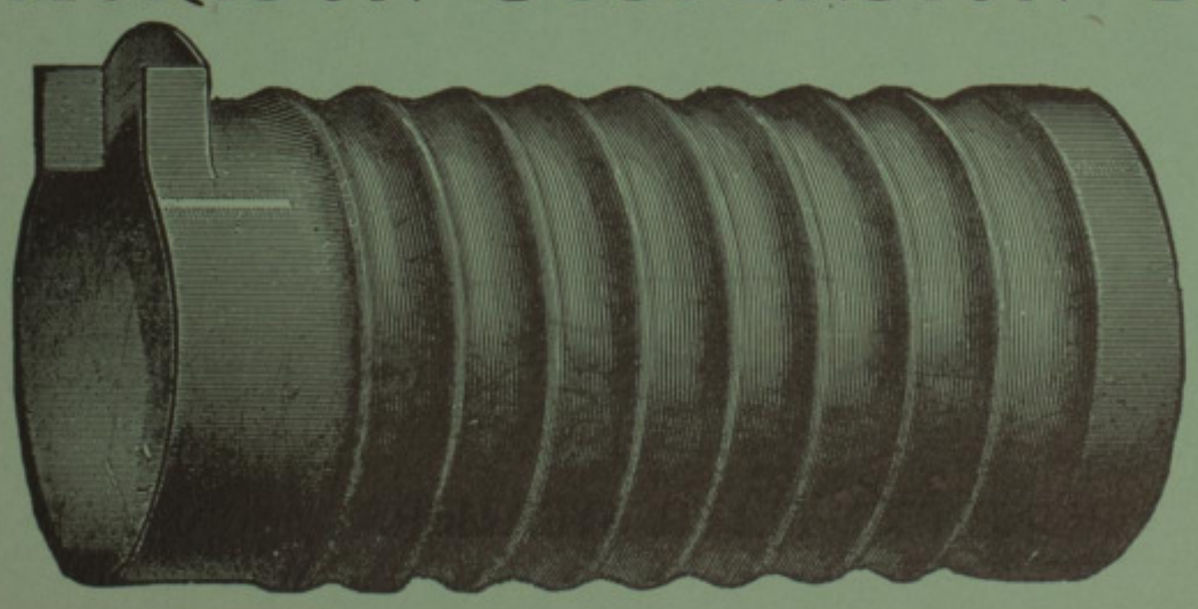

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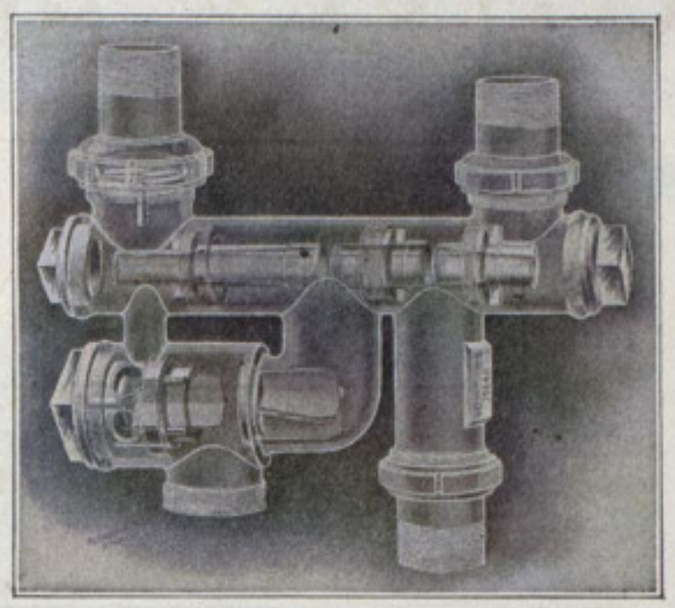

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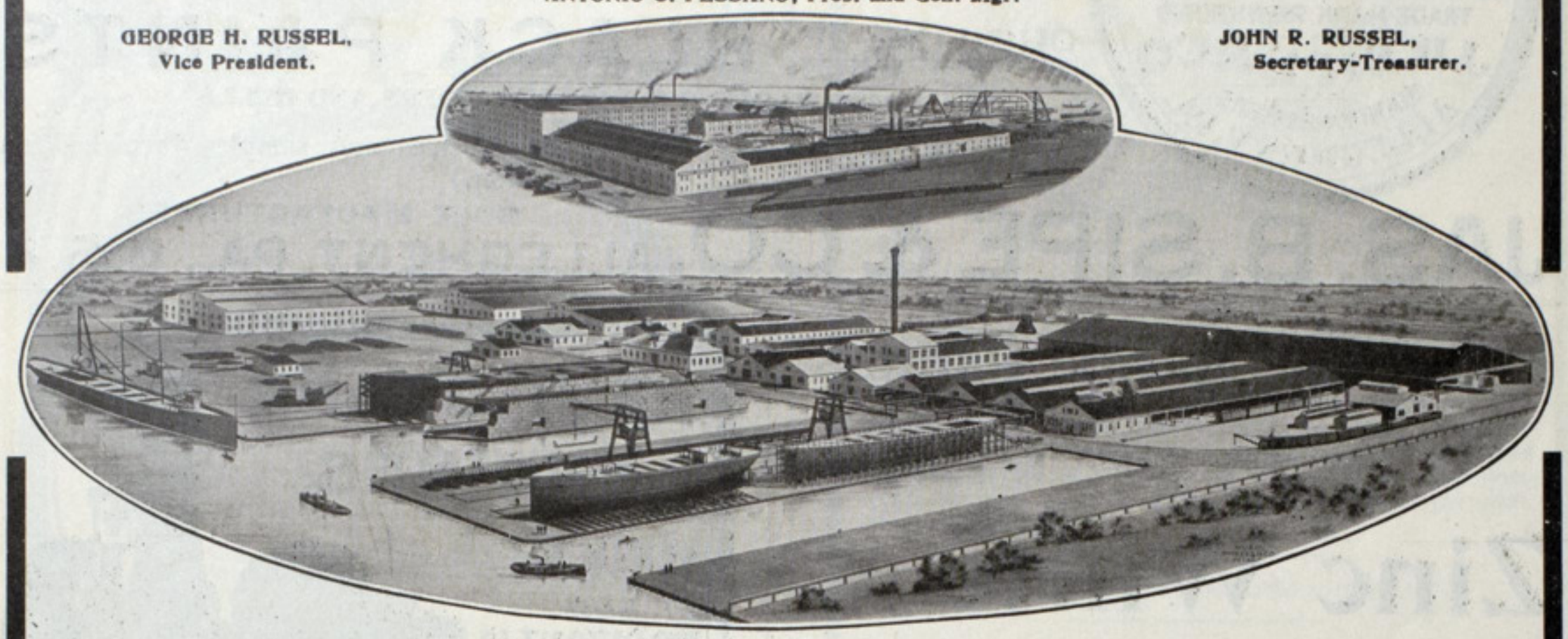

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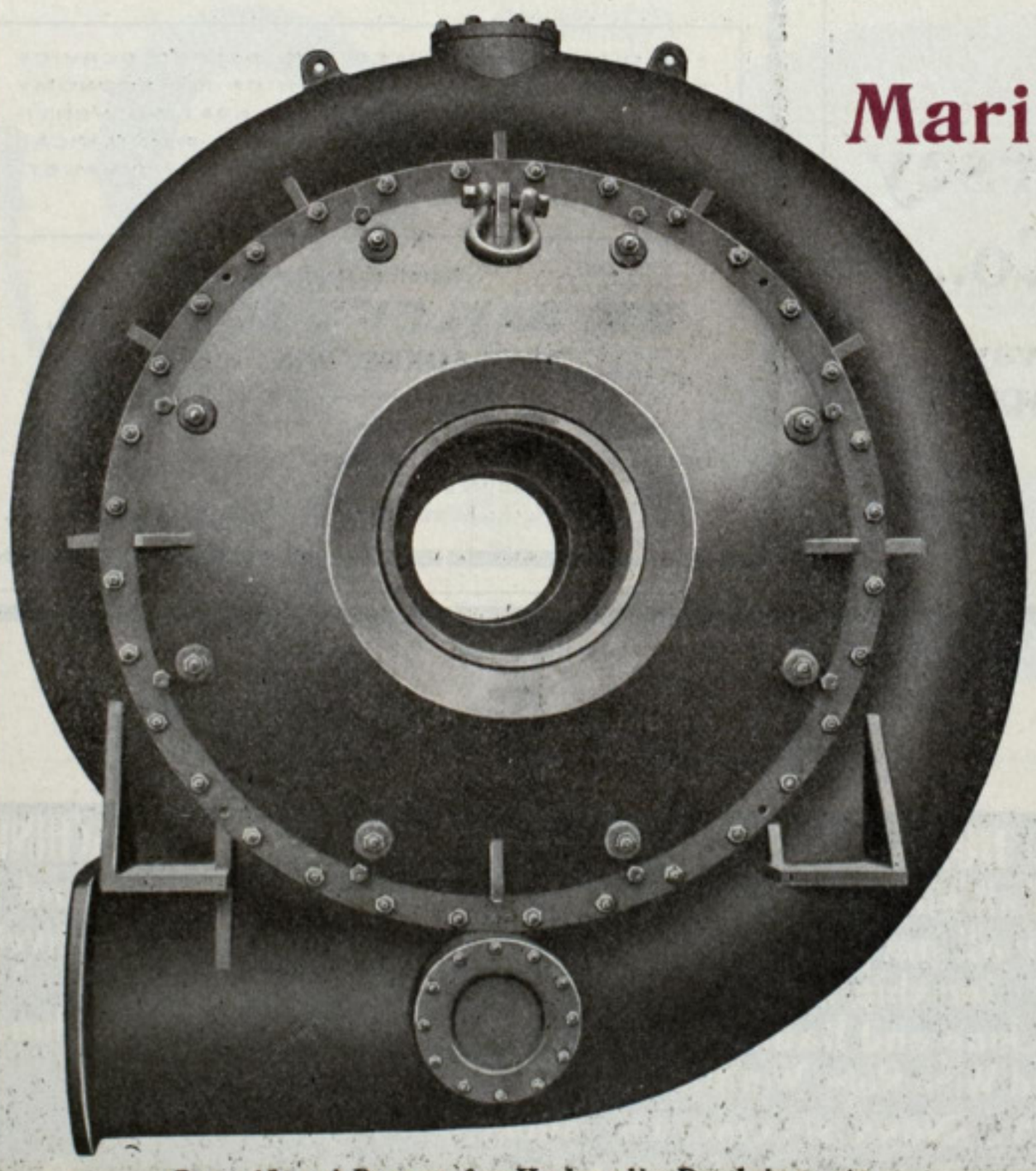

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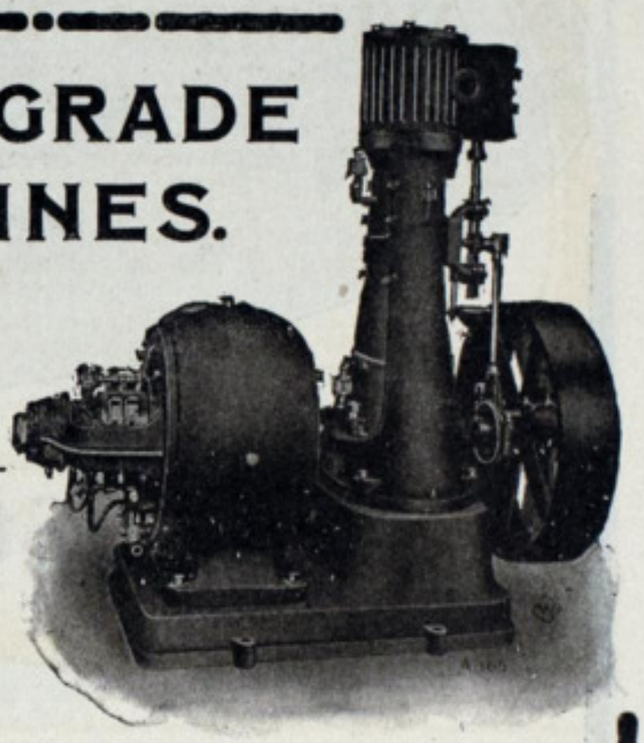

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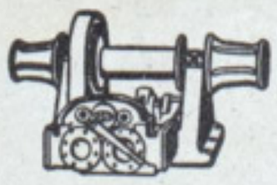

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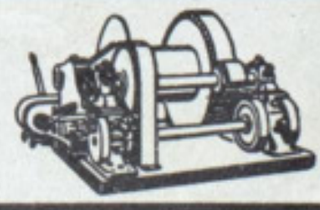

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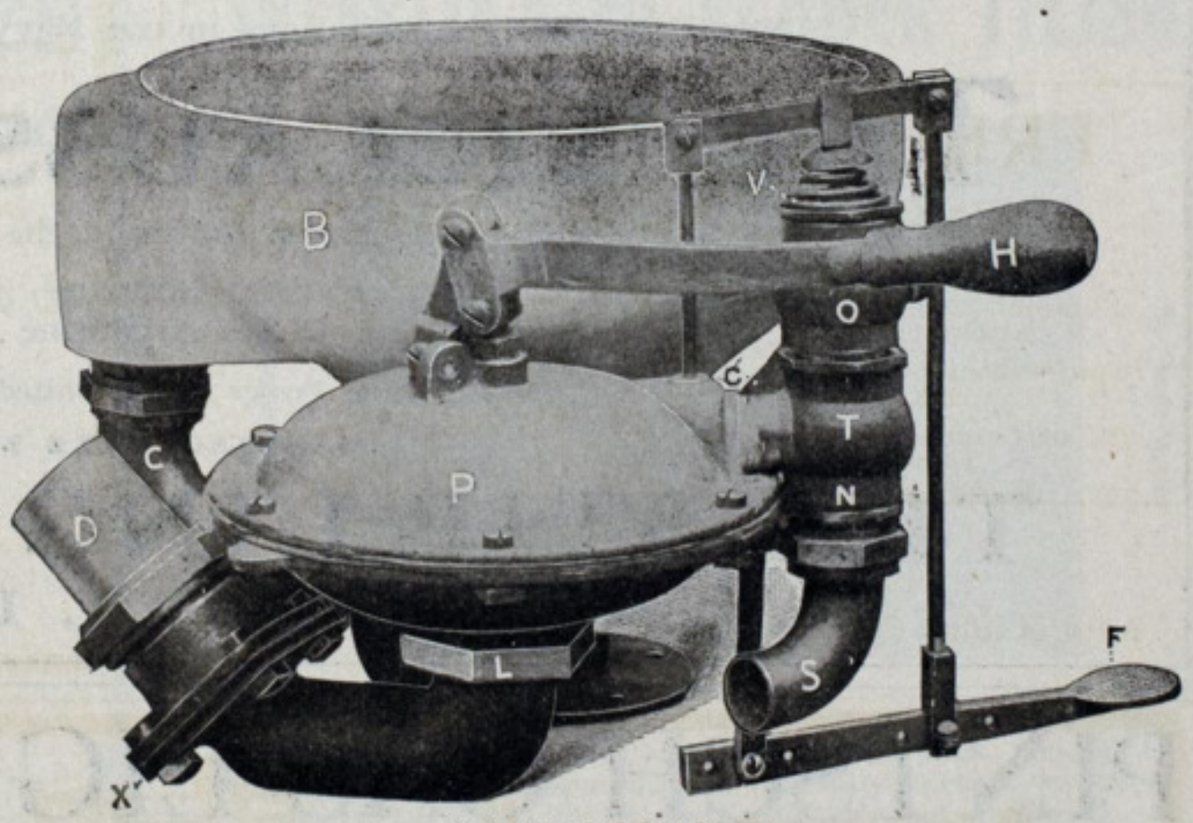

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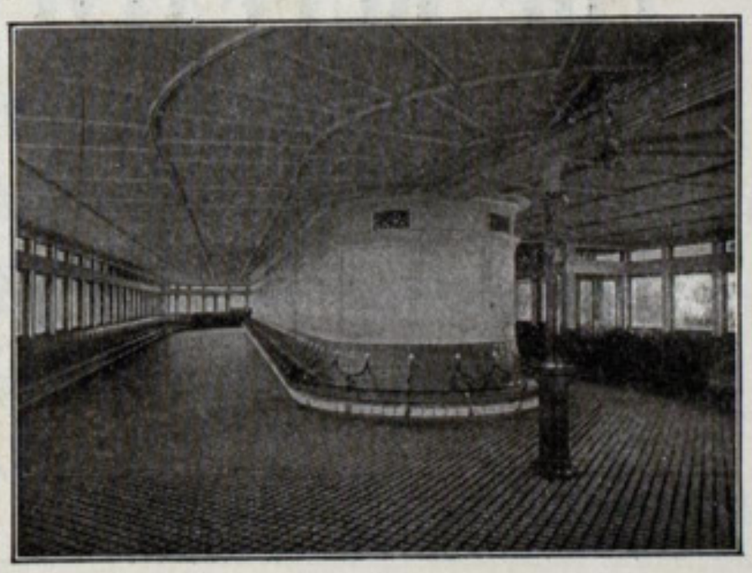

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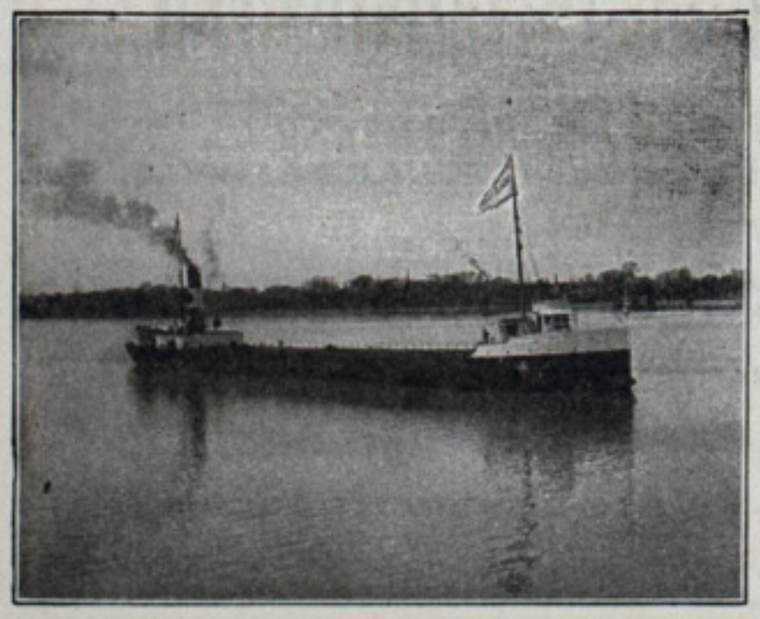

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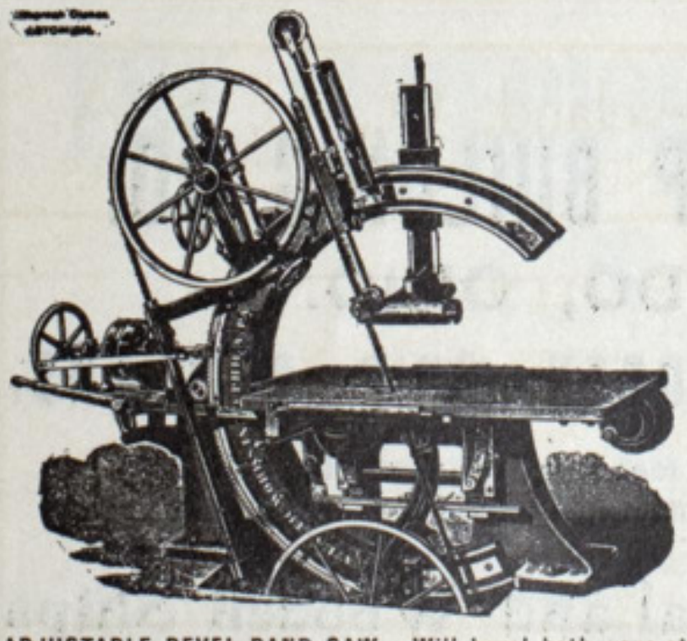

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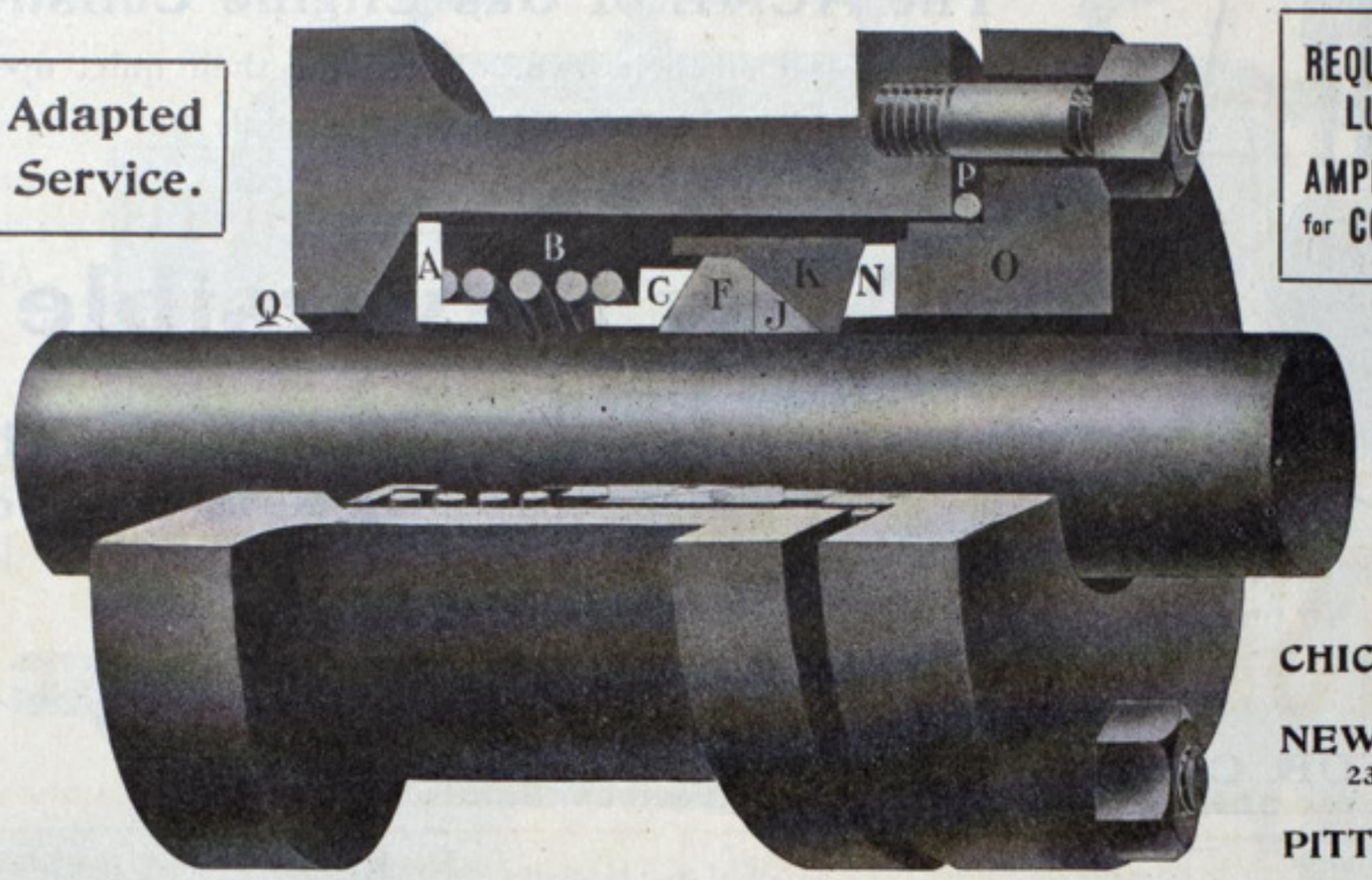

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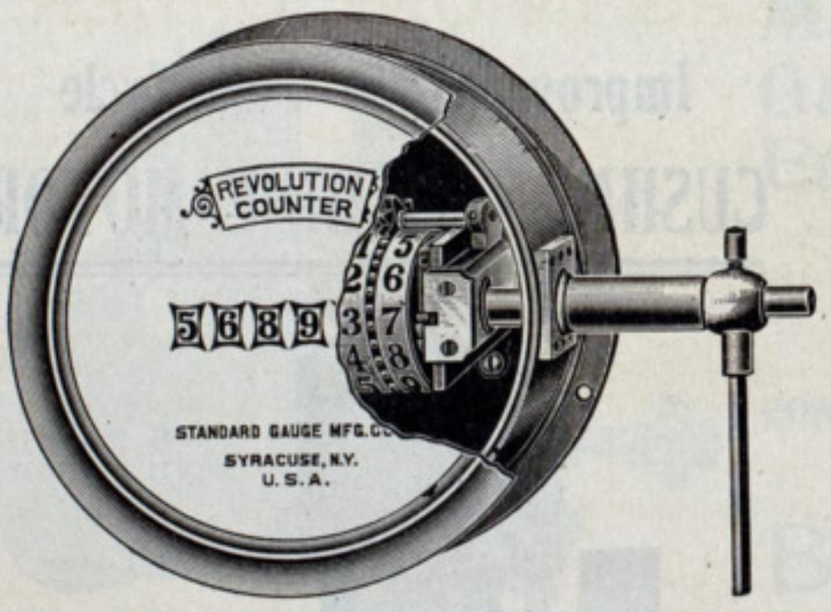

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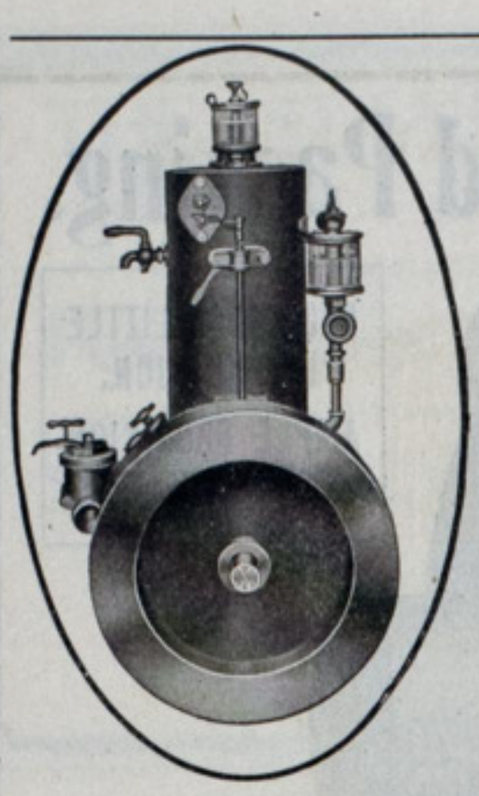

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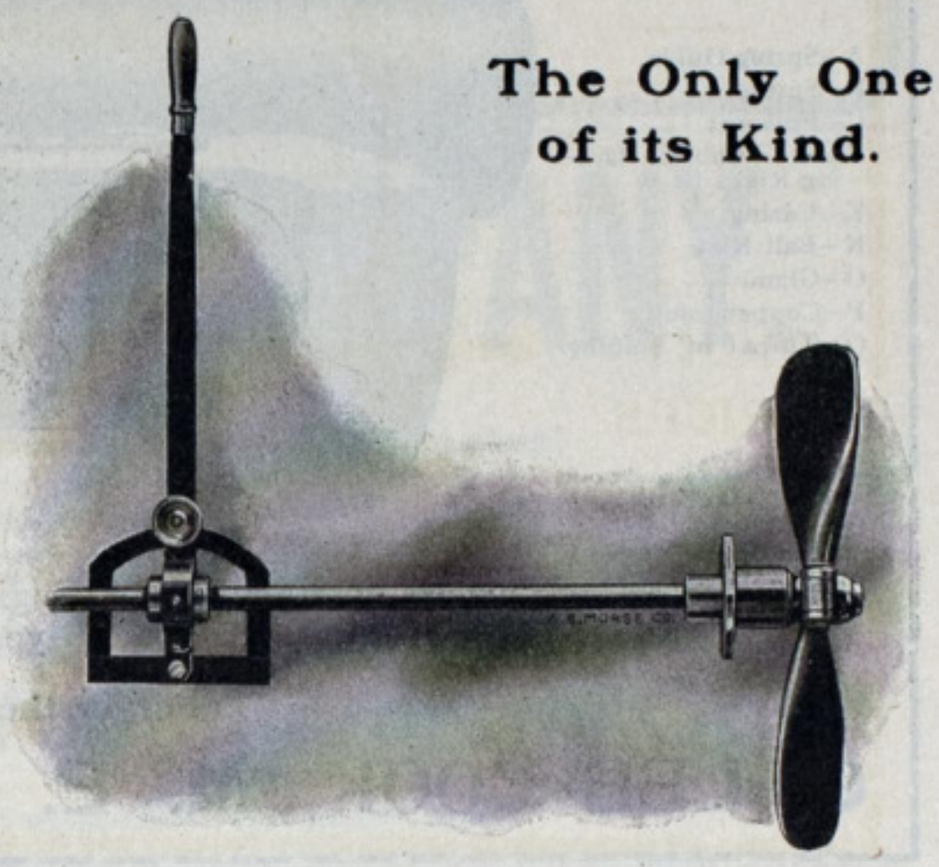

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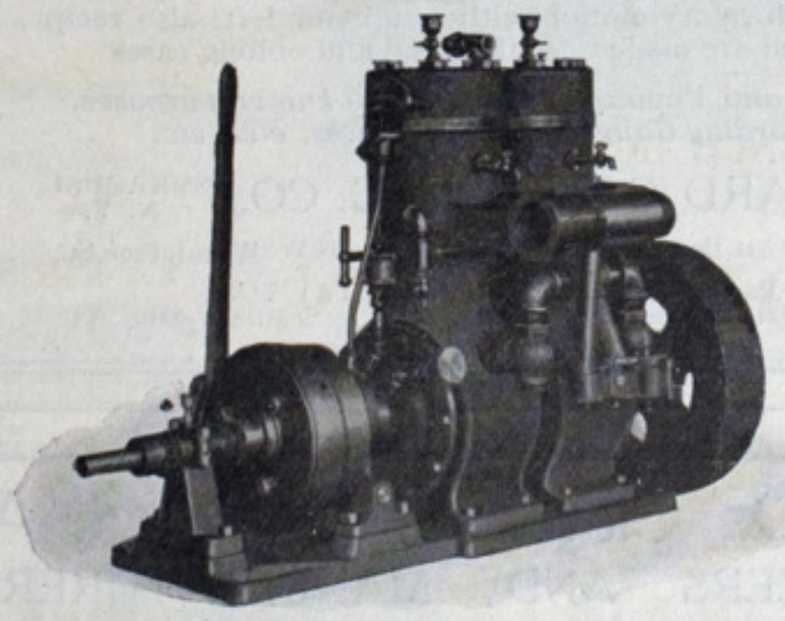

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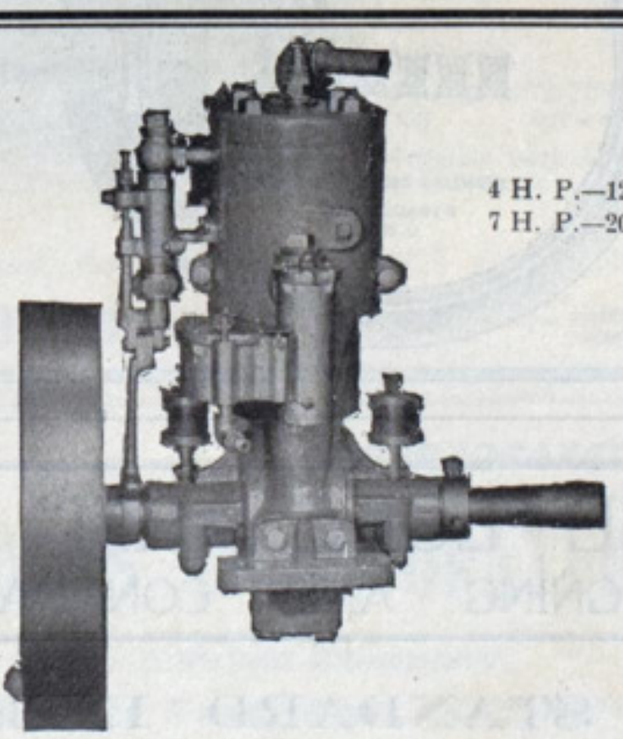

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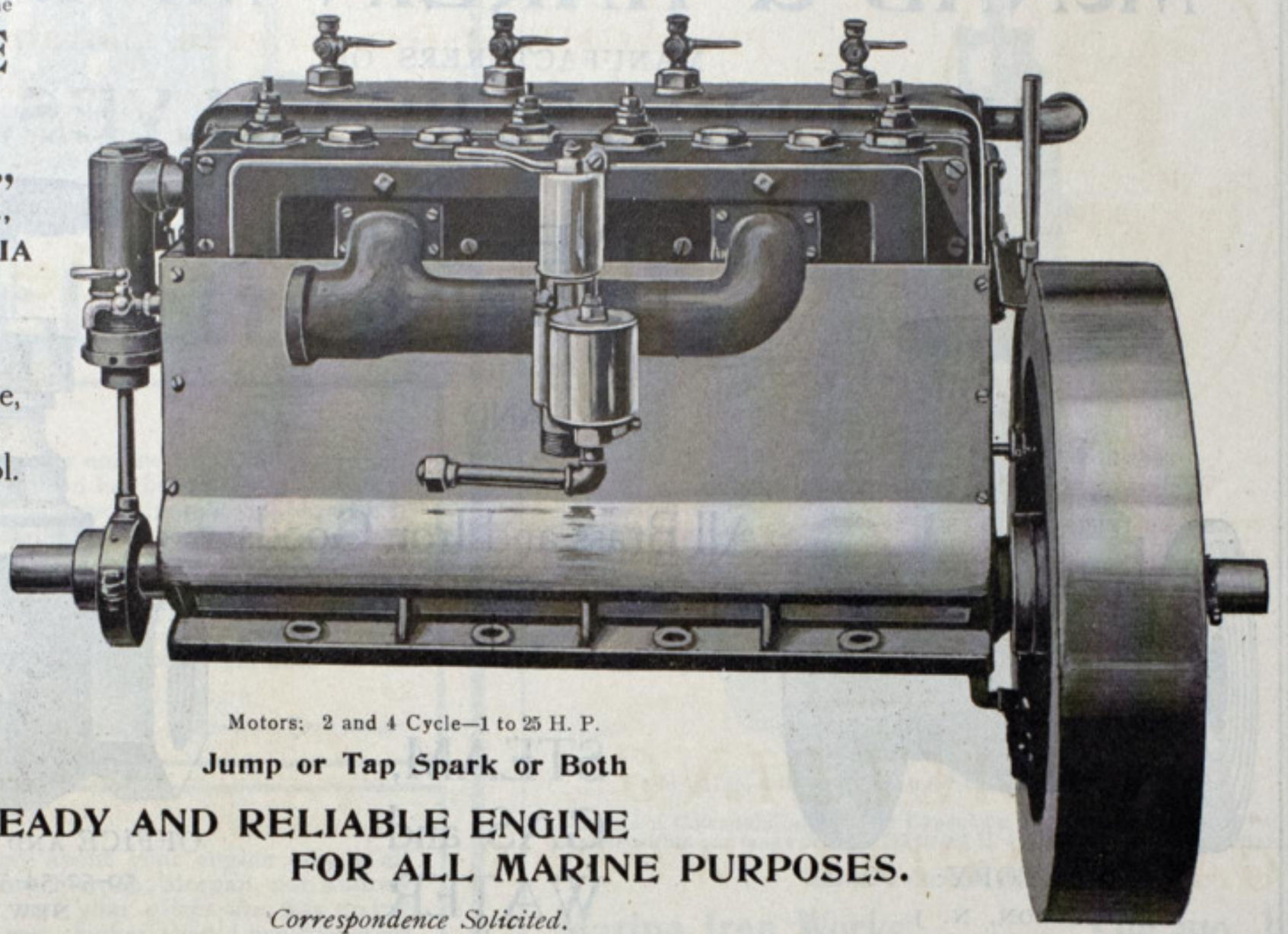

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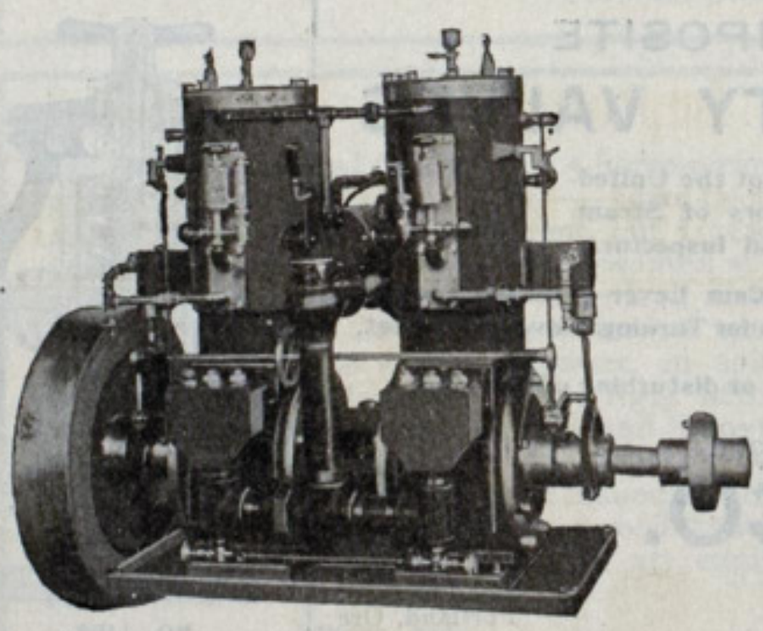

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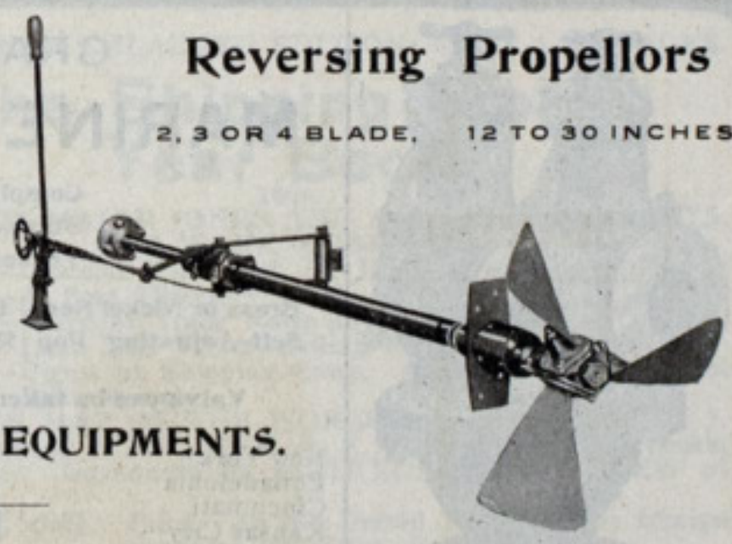

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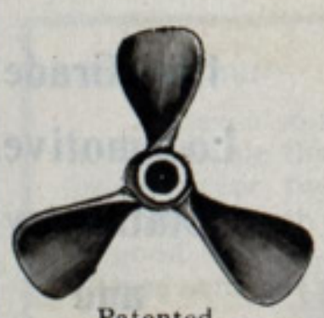

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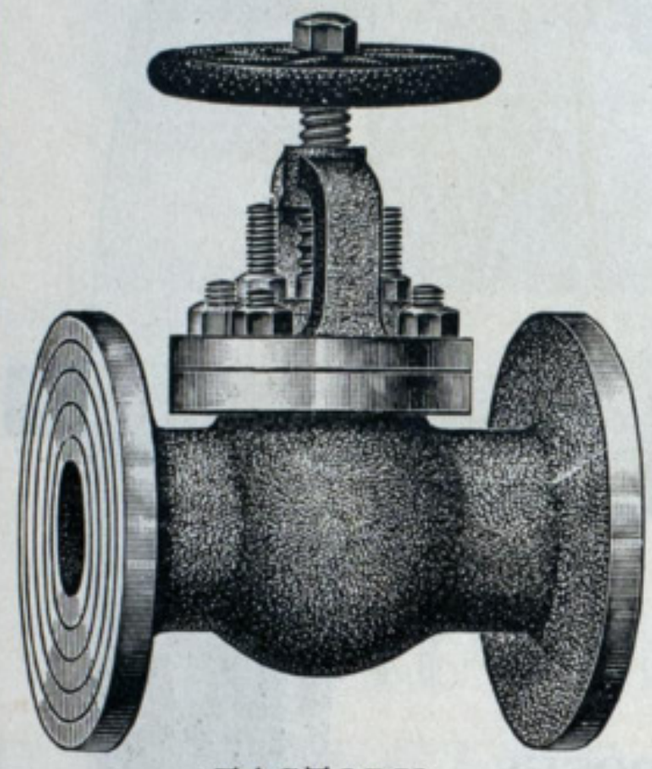

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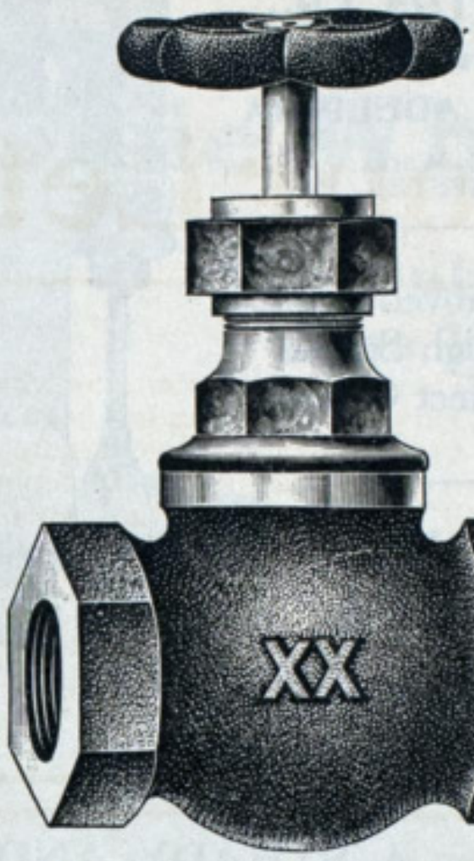

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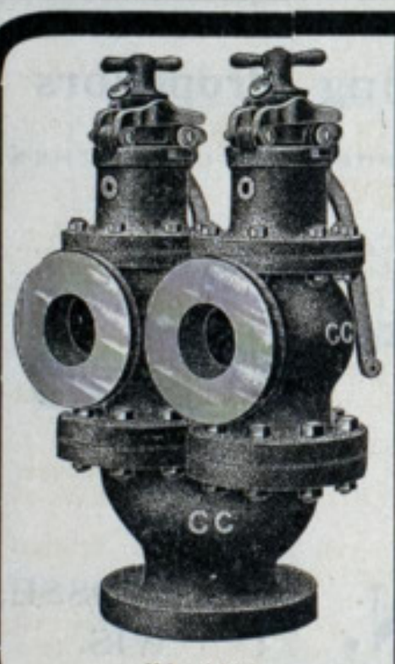

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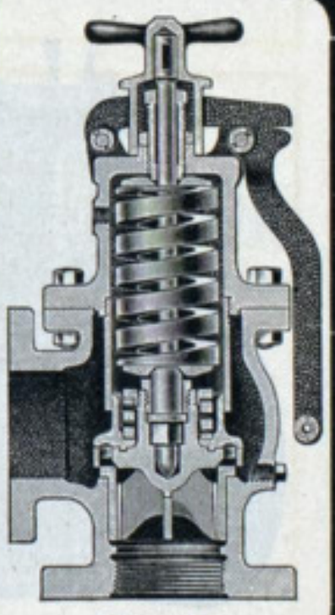

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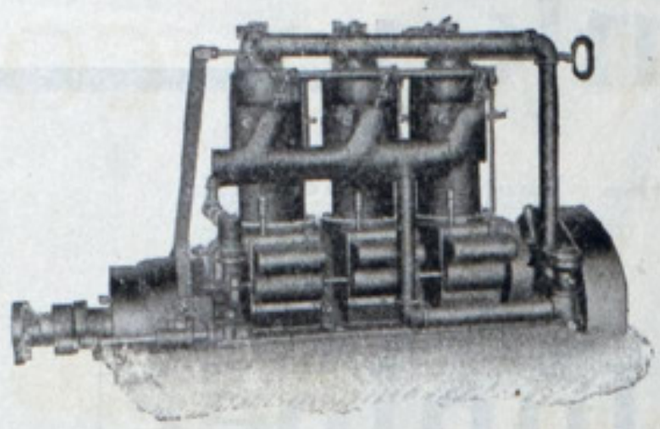

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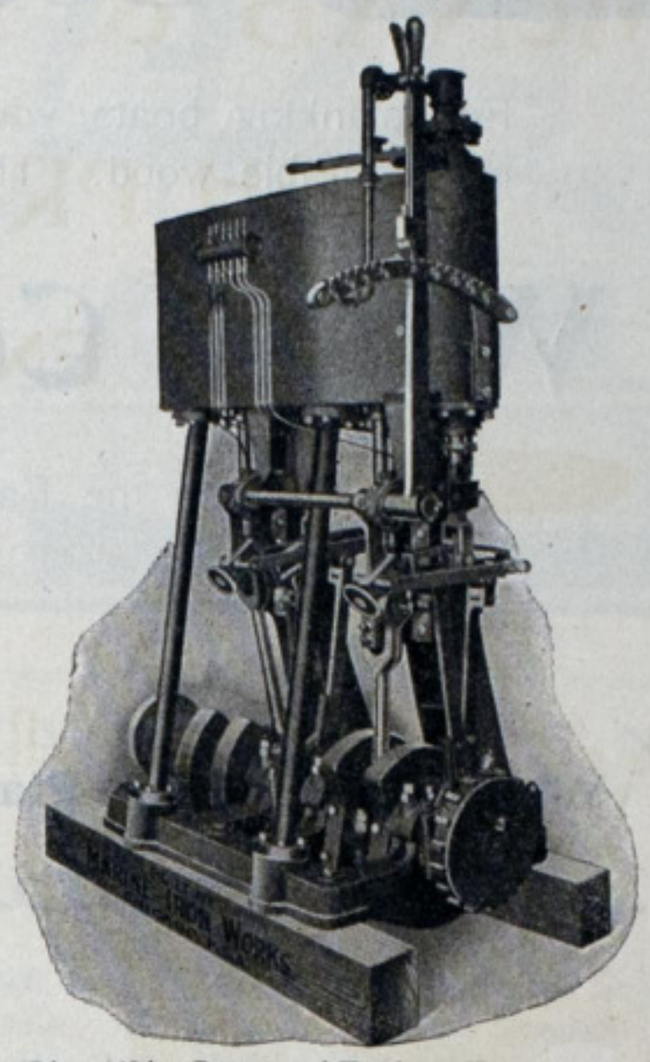

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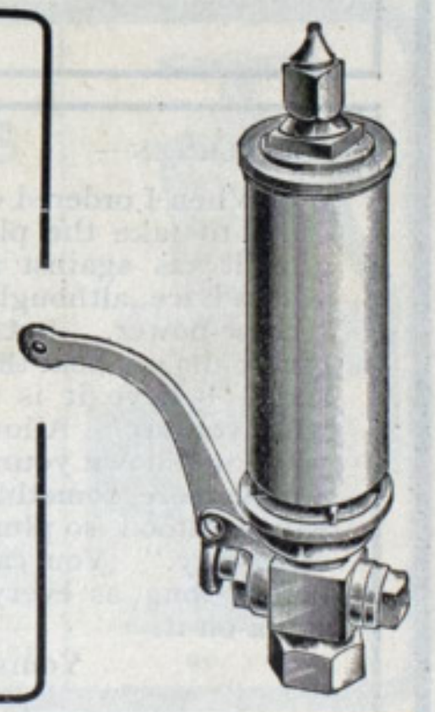

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